

HSL No. 75-9
SEPTEMBER 30, 1975

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**U.S. Department of
Transportation**

**National Highway
Traffic Safety
Administration**



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Highway Safe

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Order by title and accession number: PB, AD, or HS.

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Corporate author: Inquiries should be addressed to the organization listed in the individual citation.

Reference copy only: Documents may be examined at the NHTSA Technical Reference Division or borrowed on inter-library loan through your local library.

See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096.
Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

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**National Highway Traffic
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ERRATUM

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General Motors Res. Labs., Biomedical Science Dept., Warren, Mich.
48090; Wayne State Univ., Dept. of Mechanical Engineering Sciences,
Detroit, Mich. 48202

SPECIAL NOTICE

The National Highway Traffic Safety Administration is inviting original research articles for publication in Highway Safety Literature. These articles may be of the following types: state-of-the-art reviews, descriptions of significant work activities, evaluations of highway safety activity, or studies centered around accident reduction. All articles submitted must relate to the programs of NHTSA and be the original work of the authors, who may be members of NHTSA, industrial or contractor personnel, state or community personnel (including contributors from foreign countries), and academic community personnel. Contractors must have their contributions reviewed and approved by the responsible Contract Technical Manager in NHTSA. Detailed instructions to authors follow: For each proposed contribution one original and two copies of the manuscript should be mailed to the Chief, Technical Reference Branch, Technical Services Division, Office of Management Systems, National Highway Traffic Safety Administration, Department of Transportation, Washington, D.C. 20590. Articles must be prepared in accordance with the following instructions and the style prescribed in U.S. Government Printing Office Style Manual dated January 1973, and will normally be limited to 6000 words or four typeset pages including graphics (photos, charts, etc.). Graphic materials must be submitted with suitable cardboard backing to prevent mutilation.

PROCESSING: Acknowledgement will be made of receipt of all manuscripts. The Scientific and Technical Information Advisory Board with the Chief, Technical Reference Branch, Technical Services Division, Office of Management Systems, will evaluate each submission and determine acceptability of each article for publication. Questions such as the following are significant: (1) Does the paper make an original and substantive contribution to the literature of traffic and motor vehicle safety? Is it too similar in whole or in part to another paper recently published? (2) Are the title and abstract concise and explicit? Is sufficient introductory and summary material included to inform reader of content, importance, and utility of material covered? (3) Is the paper clear, concise and logical? Are there errors? Could it benefit from expansion or condensation in whole or in parts? (4) Is adequate credit given to other contributors in the field? Are references complete? (5) If a manuscript is not acceptable, are there revisions suggested which will make it more acceptable? Is it more suitable for publication in another manner? Authors will be allowed five days for review of galley proofs and to make minor corrections.

FORMAT: All articles should be typewritten on white bond paper on one side only with a minimum one (1) inch margin on each edge. The paper used may be either 8.5 inches x 11 inches (commercial) or 8 x 10.5 inches (U.S. Government). Double spacing must be used throughout. The first page of the manuscript should carry both the first and last names of all authors, the organizations with which the authors are affiliated, and a notation as to which author should receive galleys for proofreading. All succeeding pages should carry the last name of the first author in the

upper right hand corner (1/2 inch from top) and the number of the page.

STYLE: In general, the style prescribed by the U.S. Government Printing Office Style Manual dated January 1973 will be used. Bibliographies should be prepared in accordance with "Bibliographical Procedures and Style; a Manual for Bibliographers in the Library of Congress" (Washington, D.C., 1954, reprinted 1966).

TITLE: The title should be as brief, specific, and descriptive as possible.

ABSTRACT: An informative abstract of 100 words or less must be included typed double spaced on a separate sheet and be affixed as the first page of the package.

GRAPHIC MATERIALS: Finished art work is required. Xeroxed or reproduced material is not acceptable. A table or figure should be constructed to be completely intelligible without reference to the text. Lengthy tabulations of essentially similar data should be avoided.

Graphs, charts and photographs should be given consecutive numbers as they will appear in the text; however, figure numbers and legends should not appear as a part of the figure, but should be typed double spaced on a separate sheet of paper. Each figure should be marked lightly on the back with the figure number, author's name, complete address, and title of paper. For figures, the originals with two clearly legible reproductions should accompany the manuscript. Three glossy prints of photographs are required, preferably 8 x 10 inches in size.

Halftone illustrations are to be avoided wherever possible.

UNIT OF MEASUREMENT: Authors will normally use the English foot/pound system of measurement. The metric equivalent should be shown by a parenthetical notation wherever possible.

LITERATURE CITATIONS: References are used to cite authority for statements, indicating the page in the text where the documentation is located. Figures in parentheses are used for references, beginning with 1 and continuing sequentially throughout the text. All references should be cited on a separate sheet of paper.

In citing references, the author's full name (first, middle or initial and last) appears, followed by the title, imprint, and page or pages on which the information is located.

Example:

(1) Louis J. Pignataro. Traffic engineering; theory and practice
Englewood Cliffs, N.J., Prentice-Hall, 1973: 69-70.

BIBLIOGRAPHY: In reviews of the literature, a bibliography may be required. The bibliography provides a list of related works not cited in the references. The arrangement should be alphabetical by author. The style to be followed is given in "Bibliographical Procedures and Style; a Manual for Bibliographers in the Library of Congress" (Washington, D.C., 1954, reprinted 1966, 133 p.), sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Examples:

Gurdjian, E.S. Head injury from antiquity to the present with special reference to penetrating head wounds. Springfield, Ill., Charles C. Thomas, 1973. 139 p.

Stalnaker, Richard L., John L. Fogle, and James H. McElhaney. Diving point impedance characteristics of the head. Journal of biomechanics, v. 4, no. 2, March 1971: 127-139.

ABSTRACT CITATIONS

-HS-016 458

PMVI: THE FORCE BEHIND DIAGNOSIS

Basic steps essential to any repair are detection, diagnosis, repair or adjustment, and retest of a vehicle. On the basis of these, the demand for practical diagnostic techniques is discussed. Service operations based on gauges instead of guesses have a far better chance of solving the customer's problems the first time around, producing effective repairs more economically than is possible through intuition. The pilot diagnostic project presently in operation in the District of Columbia is described. The cost of additional facilities is discussed as not being practical until cheaper diagnostic equipment is developed, and that will only be after decision is made as to what actually needs to be diagnosed scientifically on a car. General Motors has devised a series of self-diagnosing components on a car with a plug for attaching shop-type equipment for testing. If this lead is followed by other manufacturers, they could go a long way toward uncomplicating diagnosis.

by Anonymous

Publ: MOTOR AGE v94 n2 p40-5 (Feb 1975)
1975

Availability: See publication

HS-016 282

RIDITS: A NEW LOOK AT AN OLD TECHNIQUE FOR THE ANALYSIS OF ACCIDENT INJURY DATA

A method of analyzing accident injury data, ridit analysis, was introduced by Bross in 1958. This method has been found to have two drawbacks: the results of the analysis can be affected by an arbitrary choice of the reference group; and even if the reference group can be correctly chosen, if the data from both groups are samples, then the usual estimate of the standard error from ridit analysis is too small, resulting in an anti-conservative test. These points are illustrated by application to data from a study of side-door beam effectiveness and verified by simulation. A modified procedure is suggested which eliminates both problems, and also results in a more complete description of the data. The application of the new procedure is exemplified on two sets of real data, and it is found to perform favorably in the simulations.

by J. D. Flora, Jr.

Publ: HIT LAB REPORTS v5 n3 p1-7 (Nov 1974)
1974 ; 5refs

Availability: Highway Safety Res. Inst., Michigan Univ.,
Huron Parkway and Baxter Rd., Ann Arbor, Mich. 48105

HS-016 283

FATAL AND INJURY ACCIDENT RATES ON FEDERAL-AID AND OTHER HIGHWAY SYSTEMS, 1973

Data on fatal and nonfatal injuries in motor vehicle accidents for 1973 are summarized by highway system in tables compiled from reports submitted by all 50 states and the District of Columbia. Data are included for all roads and streets in the U.S. Tables present: a year-to-year comparison of fatality rates by highway system for 1968-1973; and fatal accident

rates, fatality rates, nonfatal injury accident rates, and non-fatal injury rates by highway system and state. The 1973 fatality and injury accident data are related to vehicle registrations, population, and numbers of licensed drivers. Definitions of injury and highway types as used in the tables are included. The rates shown are uniformly carried out to two decimal places.

Federal Hwy. Administration, Washington, D. C. 20590

1973 ; 43p

Availability: GPO

HS-016 285

A MANUAL FOR PLANNING PEDESTRIAN FACILITIES. FINAL REPORT

The planner and engineer are provided with a manual giving the basic considerations necessary to plan pedestrian facilities or systems of facilities. Basic concepts in pedestrian trip generation and movement are included, along with basic types of facilities available to the planner, categorized by horizontal, vertical, and time separations. Each of the types of impacts to users and nonusers of pedestrian facilities is discussed. The interrelationships among facility characteristics and the various levels of impacts on pedestrians, motorists, abutting property occupants, and the community in general are presented. An approach to general economic cost estimating in terms of both construction cost and continuing operating and maintenance costs is described. Several means of converting these costs to a figure useful in comparing facilities and evaluating their benefits are given.

by J. C. Prokopy

Peat, Marwick, Mitchell and Co., 1025 Connecticut Ave.,

N.W., Washington, D. C. 20590

Contract DOT-FH-11-7966

Rept. No. Implementation-Pkg-74-5; PB-241 053 ; 1974 ; 81p
22refs

A summary prepared from A COMPARISON OF COSTS
AND BENEFITS OF FACILITIES FOR PEDESTRIANS,
W.G. Scott and L.S. Kagan. Prepared in cooperation with
RTKL Associates, Inc.

Availability: NTIS

HS-016 286

FUNCTIONAL DERIVATION OF VEHICLE PARAMETERS FOR DYNAMIC STUDIES

Vehicle data sets are provided characterizing the subcompact, compact, intermediate, and standard size categories of passenger cars. These data sets provide for parametric studies of the vehicle-terrain-cable barrier system using the NAE-Cornell analysis. A secondary objective of the study was to derive parametric functional relationships which could be used to calculate typical values of the required parameters. The objectives were met by a search of the published literature for vehicle parameter data. These data were then analyzed to establish parametric correlation with wheel base length or total vehicle weight. This was done for several of the primary vehicle

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parameters required for parametric studies. The results were used to generate data sets for the required vehicle categories.

by G. L. Basso
National Res. Council of Canada, National Aeronautical
Establishment, Ottawa, Canada
Rept. No. LTR-ST.747 ; 1974 ; 65p 22refs
French summary.
Availability: Corporate author

HS-016 287

THE COMBINED EFFECTS OF ALCOHOL AND COMMON PSYCHOACTIVE DRUGS: FIELD STUDIES WITH AN INSTRUMENTED AUTOMOBILE

The effects of alcohol (at .06 BAC) alone and in combinations with diphenhydramine (an antihistamine), diazepam (a sedative), and marijuana on both high and low speed driving in an instrumented car were studied. Driving was also done under a placebo condition. A peripheral vision secondary task was used to increase the visual task load on the subject to the level of the normal search and recognition task performed while driving. The intention behind this study was simply to describe the changes in driver behavior under various drug conditions. Eight subjects, six male and two female, ranging in age from 19-27, participated in the experiments. All subjects had used both alcohol and marijuana previously. An 8.5 mi. stretch of unopened highway in the Province of Ontario, Canada, was used as the site of experiments. Course speeds were 60, 30, and 25 mph. The following measures of driver performance were made: steering amplitude and frequency in the 60 mph region, steering amplitude in the 25 mph region, speed and speed variation on both 60 and 25 mph zones, reaction time to the peripheral light on the dash, number of pylons knocked down in the slalom course, and distance between the front tires and the white line adjacent to the traffic signal at which subjects were instructed to stop. Results of this experiment show that alcohol alone and in combination with other drugs affects driving performance in different ways. Measures which most clearly differentiated between drug conditions were steering movement and average velocity.

by A. M. Smiley
National Res. Council of Canada, National Aeronautical
Establishment, Ottawa, Canada
Rept. No. LTR-ST.738 ; 1974 ; 21p 14refs
Availability: Corporate author

HS-016 288

A SURVEY OF NATIONAL GEOCODING SYSTEMS. FINAL REPORT

Major geocoding systems are described and categorized by type. Section 2 deals with systems that are primarily geopolitical in nature and provide general reference coding structures for administrative or other purposes. Section 3 includes those geocoding systems that reference either special significance locations or a combination of geopolitical, geostatistical and special significance locations. The geocoding systems in Section 4 include those that reference areas delineated according to special criteria, such as economic or postal distribution patterns.

The last section discusses those systems based on grid networks.

by P. A. Werner
Department of Transportation, Transportation Systems Center,
Kendall Square, Cambridge, Mass. 02142
Contract DOT-TSC-692
Rept. No. DOT-TSC-OST-74-26 ; 1974 ; 356p 72refs
Rept. for Oct 1973-Jun 1974. Subcontracted to Massachusetts
Inst. of Tech., Urban Systems Lab., Cambridge, Mass.
Availability: GPO

HS-016 289

ROLLING NOISE AND VEHICLE NOISE

Vehicle noise is considered to consist of two parts, power train noise and rolling noise. Vehicles are classified by total noise into two groups and simplified descriptions of vehicle noise as a function of speed are presented. Estimates of rolling noise are compared with the vehicle noise relation. It is shown that rolling noise is the dominant noise source for light vehicles travelling in top gear, and that it makes a measurable contribution both to the noise made by heavy vehicles when travelling in top gear and to the noise of light vehicles under urban conditions. Rolling noise is shown to limit the possibilities for developing quiet vehicles. Rolling noise has been the subject of several experimental studies, and these are briefly reviewed. An experimental investigation has shown that for United Kingdom vehicles operating over typical U.K. road surfaces, the major parameters of rolling noise are vehicle speed, whether the road is wet or dry, tire tread pattern, and road surface type. A comparison of braking force coefficients with rolling noise levels indicate that it is not necessarily true that reducing tire noise must reduce adhesion.

by D. G. Harland
Transport and Road Res. Lab., Transport Systems Dept.,
Crowthorne, Berks., England
Rept. No. TRRL-LR-652 ; 1974 ; 19p 22refs
Based on a paper given at the ICA Satellite Symposium (8th)
on Noise in Transportation, Southampton Univ., Jul 1974.
Availability: Corporate author

HS-016 290

PREDICTING ROAD TRAFFIC NOISE IN THE RURAL ENVIRONMENT: A STUDY OF THE A66 ROAD IMPROVEMENT SCHEME IN THE LAKE DISTRICT

Traffic noise measurements were made along 26 mi. of the A66 within the Lake District National Park and the towns of Keswick and Cockermouth, England. The town studies form the first part of a before and after survey to assess the noise benefits to be derived from by-passes due to be completed in 1975. The measurements made along the rural sections were used to derive and validate a noise prediction model appropriate to both the conditions found alongside the highway and for rural areas generally. The prediction method is based on the TRRL traffic noise computer model. Validation studies indicate that the standard error of the differences between the observed and predicted results was 2.5 dB(A). A large proportion of the standard error can be attributed to the effects produced on the measured results by varying meteorological conditions. Given this constraint it is unlikely that the accuracy of the prediction can be improved, but it can be recommended for planning and assessment purposes. The method

for traffic on the existing highway A66 and for projected traffic conditions on a planned improved route of the A66.

by P. M. Nelson; N. Godfrey
Transport and Road Res. Lab., Transport Systems Dept.,
Crowthorne, Berks., England
Rept. No. TRRL-LR-642 ; 1974 ; 30p 12refs
Availability: Corporate author

HS-016 291

**ENERGY CRISIS AND INSURANCE RELATED
MATTERS. INDUSTRY ADVISORY COMMITTEE
REPORT TO THE SPECIAL N.A.I.C. TASK FORCE**

Results of the Accelerated Monitoring System are presented for the first six months of 1974. The purpose of this system was to develop data promptly through extraordinary procedures to indicate any overall trends which might occur as a result of the energy crisis. For all private passenger automobile insurance coverages combined on a countrywide basis, the data through June continue to show that the reductions in frequency, due to both the long term trend and to the short term effect of the energy crisis, have been offset by the effects of inflation on the cost of things for which automobile insurance pays. Statistics are provided on loss ratio data, claim cost and claim frequency data, gasoline allocations and traffic volume trends. It is concluded that the effect on automobile usage caused by the gasoline shortage is essentially over, and additional reports with the accelerated Monitoring System would only reflect some short or long term variables not directly related to the energy crisis.

Industry Advisory Com.
1974 ; 19p
Availability: Reference copy only

HS-016 292

**VERKEHRSSICHERHEIT IM FERNSEHEN
(CONTROL OF SUCCESS OF TRAFFIC SAFETY
BROADCASTS OVER TELEVISION)**

The increase of traffic accidents during recent years has brought about an increase of TV broadcasts to educate traffic participants. No findings could yet be determined on the effect upon the behavior or mental attitude of the traffic participants. A special inquiry made by INFRATEST, by order of West German television, on the broadcast of "The Seventh Sense" seen weekly in connection with Deutsche Verkehrswacht is examined. A comparison is made with the methods of control of success as developed by Fleischer of the University of Southern California. The results indicate that, due to the heterogeneous European broadcasting conditions, both the function of information as well as a change in attitude can be determined.

by G. H. Wind
Publ: INTERNATIONALES VERKEHRSWESSEN v26 n6
p268-72 (1974)
1974 ; 9refs
Text in German. English and French summaries.
Availability: See publication

**TRAFIKOLYCKOR I TATORT. 1. ANALYS AV
TRAFIKOLYCKOR I KORNSNINGAR, GOTEBOG
1971 (TRAFFIC ACCIDENTS IN URBAN AREAS. 1.
ANALYSIS OF TRAFFIC ACCIDENTS AT
INTERSECTIONS, GOTEBOG 1971)**

Characteristics of traffic accidents and levels of traffic safety are compared according to different types of regulation, volumes of traffic, and types of design. The study comprises 435 grade intersection accidents reported to the police in the Goteborg, Sweden, area during 1971. Ten types of accidents are defined: pedestrian, cyclist, track-bound vehicles, overtaking vehicles, single vehicle accidents, bumper-to-bumper, head-on, turning, right-angle collisions, and others. For all intersections, several variables are identified and analyzed: volume of traffic, type of traffic load, type of intersection, regulation, and channelization. For three-way intersections, the most usual types of accidents are single vehicle (16%), turning off (25%), and right-angle collisions (24%). In four-way intersections, the most common are bumper-to-bumper (10%), turning off (26%), and right-angle collisions (31%). The proportion of personal injury accidents for both three- and four-way intersections is 20%. The accident ratio for signal regulated intersections decreases with an increasing degree of time segregation of traffic streams. Accident proportion increases or decreases are given for both three- and four-way intersections when vehicle conflicts are not eliminated, when they are partially eliminated, and when they are completely eliminated. Increases and decreases in proportions of turning off accidents, right-angle collisions, and bumper-to-bumper accidents are related to the degree of segregation at both types of intersections. Increasing degree of coordination is associated with a decrease in accident ratio for three-way intersections and an apparent increase for four-way intersections. Going against a red light was found to increase the proportion of personal injury accidents to 59% (where mean value is 18%) at three-way intersections, and to 36% (where mean value is 19%) at four-way intersections. Going against a red light caused seven out of nine pedestrian accidents and eight out of 14 right-angle collisions at three-way intersections. At four-way intersections, 16 out of 35 pedestrian accidents and 110 out of 147 right-angle collisions involved red light violations.

by S. O. Gunnarsson; L. Olsson
Chalmers Tekniska Hogskola, Institutionen for Stadsbyggnad,
Goteborg, Sweden
Rept. No. UDK-656.1.057.7,08 Medd-66 ; 1974 ; 160p 33refs
Text in Swedish. English summary.
Availability: Corporate author

HS-016 294

**TRAFIKOLYCKOR I TATORT. 2. ANALYS AV
TRAFIKOLYCKOR FORE RESPEKTIVE EFTER
SIGNALREGLERING AV KORNSNINGAR (TRAFFIC
ACCIDENTS IN URBAN AREAS. 2. ANALYSIS OF
TRAFFIC ACCIDENTS BEFORE AND AFTER
SIGNAL REGULATION OF INTERSECTIONS)**

Characteristics of traffic accidents and levels of traffic safety before and after signal regulation of 30 intersections in Stockholm and 10 in Goteborg are determined and compared, and the cost benefit of signal regulation is estimated. The study covers 14 three-way and 26 four-way intersections signalized during the period 1969-72. Data collected for each

intersection were: geometric design and equipment, signal cycle, traffic flow, type of regulation before signalization, speed limit, signal installation and running costs, and number of accidents before and after signalization. Accidents are classified as: right-angle collisions, turning off, bumper-to-bumper, vehicle vehicle collisions, cyclists, and pedestrians. Total right-angle collisions at both types of intersections decreased significantly. At three-way intersections, all types of accidents except bumper-to-bumper decreased. At four-way intersections, turning off accidents increased, bumper-to-bumper accidents were unchanged, and all other types decreased. The proportion of personal injury accidents was not appreciably changed, but their number decreased significantly as a result of signalization at both types of intersections. Accident cost reductions for one year were estimated to cover both signal installation cost and running costs for one year. Three- and four-way intersections with a high proportion of turning traffic recorded the biggest accident reductions. Signal regulation showed a greater accident reduction on roads with 50 km/h speed limits than those with 70 km/h limits. Three-way intersections at which only conflicts between vehicles from intersecting links were eliminated showed the biggest accident reduction, while at four-way intersections, the situation was reversed. Both types of intersections recorded the biggest accident reduction where none of the approaches had a special left turn lane. Four-way intersections recorded bigger accident reduction where direction restrictions occur. Four-way intersections showed a bigger accident reduction where left turns were not permitted than where they were. The number of turning off accidents increased at intersections where left turns were not permitted and decreased at those where they were allowed.

by S. O. Gunnarsson; L. Olsson
Chalmers Tekniska Hogskola, Institutionen for Stadsbyggnad,
Goteborg, Sweden
Rept. No. UDK-651.1.057.7:656.08 Medd-67 ; 1974 ; 74p 4refs
Text in Swedish. English summary.
Availability: Corporate author

HS-016 295

FATAL CRASHES AMONG MICHIGAN YOUTH FOLLOWING REDUCTION OF THE LEGAL DRINKING AGE. CORRESPONDENCE AND RESPONSE

Zylman's challenge of the conclusion that the change in the legal drinking age in Michigan on January 1, 1972 led to an increase in the number of young drivers involved in alcohol-related collisions is discussed. Zylman concludes from his analysis of 1972 and the first nine months of 1973 data, that changes in reporting practices are reflected in the recent increase in alcohol-involvement in fatal crashes. It is contended that Zylman's analysis of the data he presents is misleading and that a more reasonable interpretation of the data leads to a confirmation of the original hypothesis, which is that the lowering of the drinking age led to an increase in alcohol-involved fatal collisions among young drivers.

by R. G. Ferrence; P. C. Whitehead; R. Zylman
Publ: JOURNAL OF STUDIES ON ALCOHOL v36 n1 p171-
7 (Jan 1975)
1975 ; 17refs
Availability: See publication

HS-016 296

ACCIDENT CAUSATION

Results of the combined efforts of four organizations, during an 18-month period, to make a systematic and comprehensive analysis and evaluation of the fundamental causes of accidents on the Pennsylvania Turnpike System are summarized. History and background of the problem are reviewed. It is concluded that the vast majority of accidents are caused by human error and, to a smaller extent, by vehicle failure, both factors being influenced by environmental conditions. Human and vehicle factors related to accident causation are: failure to cope with road conditions; illegal and unsafe actions; inattention; vehicle failures; deficiencies in routine driving skills; misperception; failure to avoid objects in the road; and intoxicants. Of all accidents during 1952-53, 86.5% were precipitated by driver error, with failure to cope with road conditions and illegal and unsafe actions accounting for 42%, inattention for 16.9%, vehicle failures for 13.5%, skill deficiencies 11.4%, and misperception 8.1%. The four main environmental factors are classified as light, weather, and roadway conditions, and roadway characteristics. While human error is not confined to adverse environmental conditions, failure to compensate adequately for the increased difficulty of the driving task causes human error to increase disproportionately. Appendices give a selective review of the literature, results of field surveys, and environmental section including vehicle involvement frequency tables and contingency tables, contingency tables on human factors related to turnpike accidents and on environmental influence on accident behavior, and exhibits.

by P. Blotzer; R. L. Krumm; D. M. Krus; D. E. Stark;
Pennsylvania Turnpike Joint Safety Res. Group
1954 ; 318p 363refs
Cooperating organizations: Pennsylvania Turnpike
Commission; J. E. Greiner Co., Baltimore, Md.; American
Inst. for Res., Pittsburgh, Pa; and Union Switch and Signal
Div., Westinghouse Air Brake Co., Swissvale, Pa.
Availability: Union Switch and Signal Div., Westinghouse Air
Brake Co., Swissvale, Pa.

HS-016 297

AUTOMOBILE MAINTENANCE IMPACT ON FUEL CONSUMPTION

A linear model constructed for the fuel economy degradation of the automobile is described which indicates that regular engine maintenance at 6000 miles rather than the usual 12,000 miles would not be cost effective. Even though 1 1/2% reduction in average auto fuel consumption results, it would cost typically \$50 per year versus \$30 per year at the usual maintenance levels. This figure includes the cost of both tune-ups and wasted fuel. That increased maintenance is not cost effective does not depend on the linearity assumption of this model; however, the precise amount of fuel conservation does. Data exist from which a more accurate fuel consumption analysis can be made.

by C. C. Klimasauskas
Department of Transportation, Washington, D. C.
1973 ; 18p 11refs
Availability: Reference copy only

HS-016 298

RURAL SPEED/FLOW RELATIONS

A major study of the relation between journey speeds and traffic flow on different types of rural roads in Great Britain is described, along with the ways in which the relation is affected by traffic composition and road layout. Speed measurements and traffic counts were carried out on 37 sections of road throughout the country, mainly during 1968. The variability of the basic data caused difficulties in analysis, and the underlying relationships were not always well-defined. The use of pcu-values for speed/flow purposes was rejected. Care was taken to avoid bias from various sources. It was found that speed/flow relations on all types of rural roads could be adequately represented by straight lines; on motorways and other dual roadways, speeds did not start to fall until high levels of flow were reached. There was no indication that speeds fall more rapidly as flows reach their highest levels. Formulas were derived which define the positions and the slopes of the speed/flow lines in terms of traffic composition and road layout.

by N. C. Duncan
Transport and Road Res. Lab., Traffic Systems Div.,
Crowthorne, Berks., England
Rept. No. TRRL-LR-651 ; 1974 ; 36p 10refs
Availability: Corporate author

HS-016 299

VEHICLE OPERATING COSTS IN 1973

The latest version is given of formulas for vehicle operating costs. The only changes in the basis of the formulas relate to the treatment of depreciation and vehicle time saving and to tire costs. Formulas are given for the operating cost per kilometer for traffic of an average composition for different classes of vehicle and also for the cost including all taxation. The costs given in this report relate to the end of 1973; since then there have been a number of changes.

by R. F. F. Dawson; P. Vass
Transport and Road Res. Lab., Crowthorne, Berks., England
Rept. No. TRRL-LR-661 ; 1974 ; 12p 19refs
Availability: Corporate author

HS-016 300

EMISSIONS AND FUEL-ECONOMY TEST METHODS AND PROCEDURES. CONSULTANT REPORT

The statistical variability of CVS-CH emission tests for 1975 and subsequent model year light duty motor vehicles and the relative magnitudes of the various factors affecting both systematic and random errors encountered during CVS-CH tests are considered. Additional questions concerning the effect of ambient temperature on exhaust emissions, the suitability of present exhaust-emission-control durability test methods and procedures and the possible modifications of the present hydrocarbon exhaust emission standards and measuring techniques designed to account for only reactive hydrocarbon are also addressed. Recent data relating to the effectiveness of present evaporative hydrocarbon emission test methods and

procedures and light-duty motor vehicle evaporative control systems are presented and discussed.

by R. A. Matula
Environmental Protection Agency, Office of Mobile Source
Air Pollution Control, Washington, D. C.
1974 ; 162p 59refs
Sponsored by the National Academy of Sciences, Com. on
Motor Vehicle Emissions, Commission on Sociotechnical
Systems.
Availability: Corporate author

HS-016 301

RESTRAINT SYSTEM EFFECTIVENESS (A STUDY OF FIFTEEN SYSTEMS)

A comprehensive assessment is presented of the injury-reducing potential of various automobile occupant safety restraint systems, including both existing and proposed systems, some of which require occupant participation (active systems), some of which do not (passive systems), and some systems with both active and passive elements. Elements considered were: lap belts, shoulder harnesses, air bags, and impact resistant panels. These were considered in various combinations, for various seating positions, with the belt systems using current webbing and constant force webbing. All drivers were assumed to be protected by a third-generation energy absorbing steering column. The benefit criterion used was the number of motor vehicle fatalities among unrestrained occupants which would be avoided through use of a safety restraint system. Mathematical models were used to develop a method of assigning an effectiveness value to any given system. This effectiveness value was then applied to fatal accident data from the 1969 National Safety Council report and from Cornell Aeronautical Laboratory, to compare one restraint system's effectiveness with another. Systems were evaluated in terms of human acceleration tolerances, vehicle deceleration characteristics, occupant size, impact speed, impact angle, single impact frontal collisions, seating position, multiple impact collisions, rollovers, accident and injury severity, human impact tolerances, and ejection. Findings include: about 20% of all drivers would be saved by the energy absorbing steering column alone; adding a constant force harness would increase this protection to include about 67% of those drivers who would otherwise be killed; lap belts and air bags save about the same number of front passenger lives; and with 44% usage of active restraint components, the constant force harness system for all occupants produces savings identical to those of the air bag system.

by E. S. Grush; S. E. Henson; O. R. Ritterling
Ford Motor Co., Automotive Safety Affairs Office, P. O. Box
2053, Dearborn, Mich. 48121
Rept. No. S-71-40 ; 1971 ; 111p 14refs
Availability: Corporate author

HS-016 302

DER ELEKTRONISCHE KIENZLE-FAHRTSCHREIBER (THE ELECTRONIC KIENZLETACHOGRAPH)

Tachographs, recording measuring instruments with high accuracy, are described which give a wide range of information about the ride of a motor vehicle. Common speedometers use the eddy current effect and are driven by a flexible mechanical

shaft. The development of the Electronic Kienzle Tachograph was based on the demand of an electrical signal transfer between the pick-up at the gear box and the instrument on the cockpit panel. The call for high signal energy, low power dissipation, and good linearity led to the application of a servo system as speed measuring device, which ensures excellent static and dynamic qualities.

by S. Eckle; C. Mollenhauer
 Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77
 n1 p10-3 (Jan 1975)
 1975 ; 4refs
 Text in German. English summary.
 Availability: See publication

HS-016 303

MOGLICHKEITEN UND GRENZEN VON ANTIBLOCKIERSYSTEMEN (CAPABILITIES AND LIMITS OF ANTILOCK SYSTEMS)

The development and problems of antilock systems are reviewed. The generation of signals and their processing are considered. Rotational wheel acceleration and specific slip, either separately or jointly, are qualified as common variables for control purposes. Possibilities of signal processing are select-low and select-high circuits as well as single-wheel control systems. The practical ways for brake pressure control are described, including control systems operating on the rear axle only and single wheel control systems. It is shown that an antilock device can improve braking stability only after the control process has been initiated. During the first braking phase, critical conditions can only be prevented where the conventional brake system of the vehicle is rated for stability. Therefore antilock systems can compensate only in part for errors in the design of conventional brake systems. It is concluded that a major improvement of the braking performance of a vehicle can be achieved only by installing an independent four-wheel control system. A substantial disadvantage of such an approach is the high price.

by M. Burckhardt; E.-C. Glasner von Ostenwall; H. Krohn
 Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77
 n1 p13-8 (Jan 1975)
 1975 ; 120refs
 Text in German. English summary.
 Availability: See publication

HS-016 304

PRAKTISCHE ERFAHRUNGEN BEI DER MESSUNG VON DIESELMOTORENRAUCH NACH ECE-R 24 (PRACTICAL EXPERIENCE WITH MEASUREMENT OF DIESEL ENGINE SMOKE PURSUANT TO ECE-R 24)

The measurement of smoke density of diesel engines for road vehicles by means of an opacimeter is described. First, critical values of the indicated regulation are described, followed by the conversion of Bosch-SZ nomination into Hartridge HSU; i.e., from the blackness value to the opacity number. The fundamental comparison of smoke values at steady state and at free acceleration is shown, and the possibilities of measurement comparisons at free acceleration are explained. The main influences on short-time soot emissions are shown, and the definition of relating smoke values which should be attached to the vehicle is explained. The smoke emission of diesel en-

gines with exhaust gas turbochargers on the test bench and in service at free acceleration is demonstrated, and the results of road tests referring to smoke emission from idle to acceleration and on to full load is shown. Special interest is given to the driving conditions. The smoke characteristics of induction diesel engines are compared with supercharged engines at different geographic heights, and different measuring methods and devices are tested. A critical evaluation of test results is given, regarding the limitations of diesel smoke emission.

by W. Dittrich
 Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77
 n1 p4-9 (Jan 1975)
 1975 ; 4refs
 Text in German. English summary.
 Availability: See publication

HS-016 305

AN ANALYSIS OF THE RELATIONSHIP BETWEEN DRIVER INJURY AND VEHICLE AGE FOR AUTOMOBILES INVOLVED IN NORTH CAROLINA ACCIDENTS DURING 1966-1970

Attention is restricted to the injuries experienced by unbelted drivers (in order to remove the confounding effect of the belt itself) in the 1960-1966 models of the following automobile makes: Standard Chevrolet, Corvair, Standard Plymouth, Standard Ford, Falcon, and Volkswagen. The results indicate, for the most part, that there is no important consistent relationship between accident severity and vehicle age. Equations relating to the computations are included along with tabular statistical data.

by G. G. Koch; D. W. Reinfurt
 Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
 p1-18 (Sep 1974)
 1974 ; 6refs
 For comments on this paper, see HS-016 306.
 Availability: See publication

HS-016 306

COMMENTS ON THE PAPER "AN ANALYSIS OF THE RELATIONSHIP BETWEEN DRIVER INJURY AND VEHICLE AGE FOR AUTOMOBILES INVOLVED IN NORTH CAROLINA ACCIDENTS DURING 1966-1970" BY G. G. KOCH AND D. W. REINFURT

Koch's and Reinfurt's conclusion that there is "no important relationship between vehicle age at time of accident and accident severity during the 1966-1970 time period" is not justified. Neither does the study provide support to the conclusion, "the decreasing trend in injury index values between 1961 and 1968 may be due primarily to various improvements in automobile design with respect to driver safety which were implemented during that time period," beyond the a priori possibility, and the well-known fact that in 1966, 1967, and 1968 specific major design changes were made. The question whether a vehicle age effect on injury severity exists, or

by H. C. Joksch
Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
p19-21 (Sep 1974)
1974 ; 6refs
For original paper, see HS-016 305.
Availability: See publication

HS-016 307

NARCOTIC USE AND DRIVING BEHAVIOR

Data on 1562 methadone maintenance patients (experimentals) in New York State were gathered through face-to-face interviews. A control group of 1059 people was constructed by asking the experimentals to volunteer names of non-addicted friends. State driver records for 718 experimentals and 579 controls were obtained and analyzed. In general, experimental subjects were no worse drivers than the controls either as patients or while they were using heroin. This was so despite the fact that the experimentals estimated their mileage to be at or above the national average throughout their abuse of non-narcotic and narcotic drugs and during their methadone treatment. It was also found that drug abusers who drive are likely to drive immediately after using drugs. There was an indication that narcotic users are able to compensate for drug effects.

by R. D. Blomberg; D. F. Preusser
Contract Ref: DOT-HS-099-1-184
Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
p23-32 (Sep 1974)
1974 ; 5refs
Based on 1971-72 study supported by the National Hwy. Traf. Safety Administration, available from NTIS as PB-216 417.
Availability: See publication

HS-016 308

THE RELATIONSHIP BETWEEN SAFETY BELT USAGE AS OBSERVED IN SELECTED CALIFORNIA COMMUNITIES AND BELT CONFIGURATION IN THE VEHICLE

In the fall of 1971, safety belt usage (lap belt only or lap/shoulder combination) was observed for more than 9000 front seat occupants of certain late model automobiles in three medium-sized communities in California. Vehicles were observed in low speed and high speed driving situations and observations recorded accordingly. Data were obtained for Chrysler, Ford, and General Motors passenger cars for model years 1968-71. Belt configuration is defined across three design variables: push-button vs. lift-latch buckle; manual vs. automatic belt adjustment; and three-point vs. four-point belt. It does not appear that belt usage is a function of vehicle age or manufacturer. At the 5% significance level, only one of the 12 relevant tests supports the hypothesis that usage is a function of belt configuration. One additional test supports this hypothesis at the 10% significance level.

by G. A. Fleischer
Contract NHTSA-2-2980
Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
p33-43 (Sep 1974)
1974 ; 10refs
Availability: See publication

CAUTION PROFILE AND DRIVING RECORD OF UNDERGRADUATE MALES

With a device called an Apprehension Meter, 60 undergraduate males watched a 5-min film of highway driving as seen from the driver's seat and recorded a moment-by-moment judgment of degree of danger, or caution level. From responses to six discrete hazards and to intervening uneventful periods, several summary scores were derived of which five differentiated significantly by driving record. The Safe Record group remained more cautious during the uneventful (baseline) periods, reacted to hazards sooner but more gradually, relaxed more gradually after their disappearance, and consequently remained alert to each hazard longer. The Violations group were at the other extreme, and the Accidents group intermediate. The Safe group appeared more prompt in detecting danger, but less abrupt in responding to it, than did the groups with infractions. In terms of consistency across six hazards or 10 baselines, reliability (Cronbach's alpha) ranged from 0.48 to 0.99. A composite caution index had an alpha of 0.85 across hazards and correctly classified 77% of subjects as either safe or non-safe. The results were found consistent with those in other studies.

by D. C. Pelz; E. Krupat
Grant MH-21276
Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
p45-58 (Sep 1974)
1974 ; 16refs
Prepared in cooperation with the Hwy. Safety Res. Inst., Michigan Univ., the Automobile Mfrs. Assoc. and the National Inst. of Mental Health.
Availability: See publication

HS-016 310

THE EFFECTIVENESS OF COMPULSORY WEARING OF SEAT-BELTS IN CASUALTY REDUCTION (WITH AN APPENDIX ON CHI-SQUARE PARTITIONING-TESTS OF COMPLEX CONTINGENCY TABLES)

At the end of 1970, the state of Victoria (Australia) introduced a law making compulsory the wearing of seat belts (largely lap/shoulder combinations) where fitted in motor vehicles, and for the next 9 months it was the only state with such a law. The effect of the legislation is evaluated by a before-and-after comparison, the frequency of deaths and of non-fatal casualties in the other states and among other road users being used as controls. The concurrent effects of an economic recession and a newspaper safety campaign are examined. It is concluded that, after allowing for concurrent factors, the legislation caused a statistically significant reduction of 21% in vehicle occupant deaths in the metropolitan area of Victoria and 10% (non-significant) in the non-metropolitan. For non-fatal injuries the corresponding reductions (both significant) were 13% and 11%. Fluctuations in the economy have a distinct effect on the frequency of road casualties, but the effect of the newspaper campaign and concurrent factors appeared to be insignificant. The Appendix outlines the method used for analyzing complex contingency tables.

by L. A. Foldvary; J. C. Lane
Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n1
p59-81 (Sep 1974)
1974 ; 15refs
Sponsored by the Insurance Inst. for Hwy. Safety, Washington, D. C. French and German summaries.
Availability: See publication

HS-016 311

A SYSTEMS ANALYSIS OF THE PROBLEM OF ROAD CASUALTIES IN THE UNITED STATES

The problem of road casualties in the United States is analyzed from a systems viewpoint. Road accident data are reviewed, an accident causation model is proposed, and accident causation factors are described in terms of human, vehicular, and environmental contributions. A comprehensive program of safety-oriented research is outlined and difficulties in setting research priorities are discussed. Accident data factors reviewed include: single vehicle, multi-vehicle, urban or rural location, light conditions, driver age, driver sex, pedestrian age, pedestrian sex, driver-vehicle-environment interfaces, vehicle behavior, alcohol, and highway safety programs.

by A. N. Kontaratos
 Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
 p223-41 (Dec 1974)
 1974 ; 20refs
 Availability: See publication

HS-016 312

A MODEL FOR THE ROLE OF MOTIVATIONAL FACTORS IN DRIVERS' DECISION-MAKING

A new model for the motivational factors in decision making processes undergone by drivers is introduced. It emphasizes the competition between the driver's desire to perform a certain act--induced by (excitatory) motives--in a certain traffic situation and the subjective risk associated with this desire. The import of this model to traffic safety work lies in its emphasis on what the driver actually does in any given traffic situation rather than on his driving skill and/or the traffic conditions as such.

by R. Naatanen; H. Summala
 Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
 p243-61 (Dec 1974)
 1974 ; 87refs
 Supported by The Res. Council for the Humanities of the Finnish Academy.
 Availability: See publication

HS-016 313

ON-THE-ROAD DRIVING RECORDS OF LICENSED RACE DRIVERS

On-the-road driving records of Sports Car Club of America national competition license holders from three states were compared with the records of other drivers of the same age and sex. In each state the race drivers had a greater number of crashes per driver, and a greater number of speeding violations, other moving violations, and non-moving violations per driver, than the drivers comprising the matched comparison group. The results cast considerable doubt as to the validity of the Master Driver's License concept, which has been given serious consideration by NHTSA. The results also suggest a need for caution regarding the assumption that advanced

driver education crash-avoidance techniques can be translated into reduced crash experience.

by A. F. Williams; B. O'Neill
 Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
 p263-70 (Dec 1974)
 1974 ; 9refs
 Prepared in cooperation with the Florida Dept. of Hwy. Safety and Motor Vehicles, the New York Dept. of Motor Vehicles and the Texas Dept. of Public Safety.
 Availability: See publication

HS-016 314

AN EVALUATION OF THE NATIONAL SAFETY COUNCIL'S DEFENSIVE DRIVING COURSE IN VARIOUS STATES

The National Safety Council's Defensive Driving Course (DDC) was evaluated by two methods: comparison of self-reported accident rates from the year before and the year after DDC, and comparison of the after-DDC rates with those reported by other drivers who were not exposed to DDC but were driving at the same time. Official state records were also collected. Information was obtained from 8182 DDC graduates (study group) in 26 states who completed a survey describing their accident histories for the 12-month period before DDC. One year later, 72% (5921) of these drivers responded to a similar self report for the 12-month period after DDC. At the time this after-DDC information was collected, comparison group information was obtained for 2397 drivers who entered the DDC program one year later. Official records from seven states were collected for approximately one third of the study and comparison group samples. DDC graduates responding to the recontact questionnaire reported significant reductions of 32.8% fewer accidents in the year after DDC as compared to the year before. The study group respondent accident rate was also significantly lower than the comparison group rate. Further analysis of self report data showed that reductions following DDC were greater for males than females, and were less for those drivers 24 years and under, with females in this age group showing the least reductions after DDC. Accident profiles after DDC, including type, severity, and manner of collision remained generally similar to before DDC profiles, although there appeared to be a positive connection between course emphasis and the magnitude of reduction for different types of accidents. The study group showed a 17.6% reduction in state-recorded accidents in the year after as compared with the year before DDC. The comparison group showed an increase of 11.9% in state-recorded accidents over the same period. The reductions in state-recorded accidents after DDC for the study group were not significantly different from those of the comparison group. However, the results of the state-recorded analysis were viewed as supporting the significant decreases found in the self reports.

by T. W. Planek; S. A. Schupack; R. C. Fowler
 Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
 p271-97 (Dec 1974)
 1974 ; 11refs
 For comments on this paper, see HS-016 315 and HS-016 316
 Availability: See publication

COMMENTS ON "AN EVALUATION OF THE NATIONAL SAFETY COUNCIL'S DEFENSIVE DRIVING COURSE IN VARIOUS STATES"

The evaluation of the Defensive Driving Course is shown to be inconclusive, and its conclusions undefendable and ungeneralizable. It is suggested that research workers evaluating countermeasures directed at modern sources of human loss, such as the damage sustained in highway crashes, have a moral and professional responsibility to exhibit and apply the same levels of scientific competence as if they were concerned with other health hazards. The DDC work reported falls short of this standard.

by B. O'Neill

Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
p299-301 (Dec 1974)
1974 ; 2refs

For original paper, see HS-016 314. For response to this comment, see HS-016 317.

Availability: See publication

HS-016 316

AN EVALUATION OF THE NATIONAL SAFETY COUNCIL'S DEFENSIVE DRIVING COURSE IN SELECTED STATES (A REPORT PUBLISHED BY THE RESEARCH DEPARTMENT OF THE NATIONAL SAFETY COUNCIL, OCTOBER, 1972) AN ASSESSMENT

Criticism is offered of the research on the Defensive Driving Course (DDC) and its effectiveness in several states. Criticism is directed at the report of research, sample biases, the lack of experimental design, self-report data, inconsistent time periods, the use of one-time questionnaires, and long-term effects of DDC on its participants.

by W. W. Sorenson

Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
p302-4 (Dec 1974)
1974

For original paper, see HS-016 314. For response to this paper, see HS-016 317.

Availability: See publication

HS-016 317

RESPONSE TO BRIAN O'NEILL'S COMMENTS. (DEFENSIVE DRIVING)

Commentary is offered on criticisms leveled by O'Neill and Sorenson on the report evaluating Defensive Driving Course effectiveness. Consideration is given to sources of bias, subjectivity, and inconclusive conclusions, as well as the lack of generalization, use of self-reports, problems of non-respondents, and long-term benefits.

by T. W. Planek; S. A. Schupack

Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
p305-7 (Dec 1974)
1974 ; 1ref

For comment papers, see HS-016 315 and HS-016 316.

Availability: See publication

MEASURES OF SITE HAZARD--HAZARDOUS MANEUVERS

Hazardous maneuvers and their possible utilization to evaluate the hazard of roadway sites are discussed. Some established hazardous maneuvers are erratic maneuvers, traffic conflicts, near-miss and hazardous regions of vehicle pairs. Hazard is defined as an occurrence function. The possible output consists of a continuous range of manifest severity events: accidents, hazardous and borderline maneuvers. An interval of that range is described by a subfunction of the occurrence function. The input consists of driver, environment and vehicle (DEV) variables. A random variable is interrelated with the DEV variables in the occurrence function forming complex interactions. In a comprehensive hazard reduction program, the concept of hazardous maneuvers is only a subset of the total hazard. Remedial techniques would be applied to the DEV variables as suggested by models of occurrence subfunctions and conventional traffic engineering studies.

by J. K. Shimada

Publ: ACCIDENT ANALYSIS AND PREVENTION v6 n3/4
p309-15 (Dec 1974)
1974 ; 16refs

Availability: See publication

HS-016 319

WORKSHOP ON DRIVER IMPROVEMENT AND DRIVER LICENSING, PROCEEDINGS SAN FRANCISCO, 14-17 FEBRUARY 1974

The primary objective of the workshop was to determine the characteristics of effective driver improvement programs: to identify target groups and specify their needs, requirements and deficiencies, indicating desirable and achievable goals; and to characterize the driver improvement programs which would be effective in achieving these goals with respect to reduced highway accidents. The target groups are: drinking drivers, youthful and older drivers, medically impaired drivers, general violators, new drivers, reading/learning problems, and license renewal applicants. Drinking drivers and youthful drivers stand out as the highest risks. Recommendations are offered which include all of the efforts involved in promoting highway safety: driver preparation, driver examination, licensing, highway patrol, traffic engineering, driver improvement, record keeping, courts, highway engineering, the legislatures, and research. Public information programs are mentioned.

by L. G. Goldstein

California Traffic Safety Education Task Force
1974 ; 106p 33refs

See also HS-016 320. Appendices B-D not included.

Availability: Reference copy only

HS-016 320

DRIVER IMPROVEMENT: A REVIEW OF RESEARCH LITERATURE

Research literature relevant to the improvement of the highway performance of drivers who are characterized by unusually high rates of violations and/or accidents is reviewed. Focus is on studies which attempt to evaluate the effectiveness of treatment programs for negligent or problem drivers.

Basic statistical characteristics of accidents and violations are shown, and specific programs are reviewed from California, Oregon, Washington, New Jersey, New York, Michigan, District of Columbia, Texas, Wisconsin, and others. The special case of the drinking driver is described, and the effectiveness of warning letters and meetings is examined.

by L. G. Goldstein
California Traffic Safety Education Task Force
1973 ; 218p 92refs
See also HS-016 319.
Availability: Reference copy only

HS-016 321

A SYSTEMATIC APPROACH TO THE CONTROL OF THE DRINKING DRIVER

Experiences related to Alcohol Safety Action Projects and seminar discussions are reviewed. Tentative conclusions are drawn. High blood alcohol concentrations (BACs) are strongly related to crash involvement, occurring in approximately half the individuals responsible for fatal crashes, while only present in 1-2% of drivers using the road but not involved in crashes. Few drivers reach the high BACs associated with fatal crashes with any frequency. Individuals who are at high BACs can be apprehended on the highway, but only a small proportion of drinking driving events are currently resulting in apprehension. The focus of enforcement activity appears to be on the middle-aged driver, rather than on the young drinking driver who is most involved in alcohol-related crashes. The drinking behavior of individuals apprehended on the road can be evaluated and those who have a drinking problem identified. It remains to be demonstrated that educational and rehabilitation programs will be effective in getting problem drinking drivers to bring their use of alcohol under control and to avoid repetition of the drinking driving offense. There is some evidence from the eight ASAPs which have been underway for a full two years and more dramatic evidence from the British experience with the Road Safety Act of 1967 to indicate that social drinking drivers can be deterred. To date, such deterrence has appeared to be transitory. The level of enforcement and public information required to maintain a high deterrence level is unknown.

by R. B. Voas
National Hwy. Traffic Safety Administration, Washington, D. C. 20590
1973 ; 24p
Presented at the Symposium on Effective Highway Safety Adjudication, New York City, 14 Nov 1973.
Availability: Reference copy only

HS-016 322

A THREE-DIMENSIONAL COMPUTER SIMULATION OF A MOTOR VEHICLE CRASH VICTIM. FURTHER DEVELOPMENT--MUTUAL FORCE-DEFLECTION CHARACTERISTICS AND COMPREHENSIVE "DEBUG: FACILITY. FINAL TECHNICAL REPORT

The Calspan Three-Dimensional Crash Victim Simulation (3-D) computer program has been developed further in an effort consisting of two primary tasks: a routine was incorporated to compute the mutual force-deflection characteristics of contacting surfaces from the measured individual characteristics of these surfaces; comprehensive diagnostic or "debug" facility

for the program was implemented to allow users to analyze computed results in varying degrees of detail. A series of simple tests was also performed to assess the assumptions used in the treatment of mutual force-deflection characteristics. The applicability of the Hertz contact stress theory, which was utilized in this treatment, was analyzed with these test results. The tests consisted of quasi-static force-deflection measurements on samples of basic geometrical shapes, and the results generally support the analytical treatment, but do indicate that limitations exist in this treatment of the complex problem of impact nonelastic surfaces. A check on model validity for this version of the program was made by repeating the simulation of a nonplanar impact sled test previously used to assess validity. Inputs for this simulation included measured individual force-deflection characteristics of selected contacting surfaces. Program routines were used to compute the required mutual characteristics. Agreement of the simulation with the experimental results was found to be generally better than previously observed.

by J. A. Bartz; F. E. Butler; C. T. Ryan
Calspan Corp., Buffalo, N. Y. 14221
Contract CALSPAN-7310-C224
Rept. No. ZQ-5326-V-2 ; 1974 ; 231p 12refs
Prepared for the Analytical Model Simulation Subcommittee, Vehicle Safety Com., Motor Vehicle Mfrs. Assoc., Detroit, Mich.
Availability: Corporate author

HS-016 323

INSTRUMENTAL COLORIMETRY OF RETROREFLECTIVE SIGN MATERIALS. FINAL REPORT

Because color-coded applications of highway signs increase, specification of colors and color tolerances are required. A measurement technique needs to be developed and described. A study for nighttime conditions was performed with colorimetric properties of 126 samples of retroreflective materials of seven different colors measured with three telecolorimeters in simulated nighttime conditions. One spectrophotometer was used to measure the color of 38 of the samples in simulated daytime conditions. The colors measured were: red, orange, brown, yellow, green, silver (white), and blue. Differences of color measured by means of different telecolorimeters on the same samples were evaluated. As a result of these studies, procedures for making colorimetric and photometric measurements were developed and are included in this report. On the basis of the color measurements and their variability tentative recommendations for color boundaries were prepared and are also included.

by I. Nimeroff; W. A. Hall
National Bureau of Standards, Washington, D. C. 20234
Contract P.O.-3-1-1011
Rept. No. NBS-74-518; FHWA-RD-75-4 ; 1975 ; 91p
Rept. for Dec 1972-30 Aug 1974.
Availability: NTIS

HS-016 324

HYDROSTATIC STEERING WITH POWER-BEYOND CAPABILITY

Integration of the power steering function into varied control hydraulic systems of mobile equipment requires an adaptive steering valve. The new Ross 5-line Hydraguide meets the

criteria and introduces unique flexibility to steering circuit design. A positive displacement-type hydrostatic steering unit is highlighted which has an integral priority steering feature and an additional fifth port connection for a secondary hydraulic function. This concept of power-beyond capability in hydrostatic steering is discussed and its versatility demonstrated. It is shown that the power-beyond Ross Hydraguide provides simplified hydraulic circuitry and increased power utilization at moderate cost for off-highway machinery.

by J. L. Rau
TRW, Inc., Ross Gear Div.
Rept. No. SAE-740435 ; 1974 ; 7p
Presented at the Earthmoving Industry Conference, Central Ill. Sec., Peoria, Ill., 23-24 Apr 1974.
Availability: SAE

HS-016 325

COLD WEATHER STARTING PROBLEMS

The cold weather starting problems confronting the fleet operator are discussed, with focus on the importance of establishing proper vehicle specifications for the intended operating environment. Difficulties such as choosing performance level, knowing and describing operating conditions, determining durability level, and approving installation are covered. Also included is an examination of some starting aids for both gasoline and diesel engines such as the proper motor oil, starting technique, and the addition of starting ether. The importance of an efficient follow-up maintenance program, once specifications have been established, is stressed.

by D. Andrew; S. A. Schuster
Dominion Consolidated Truck Lines; Schuster Express, Inc.
Rept. No. SAE-740545 ; 1974 ; 7p
Presented at the Combined Commercial Vehicle and Fuels and Lubricants Meetings, Chicago, Ill., 17-21 Jun 1974.
Availability: SAE

HS-016 326

A NEW EUROPEAN SUPERCHARGED TEST ENGINE FOR THE EVALUATION OF DIESEL LUBRICANTS

The development of a lubricating oil test for high-performance diesel engines, especially those of European manufacture, is outlined. The tentative method, CEC L-13-T-74, was developed with the cooperation of the Co-Ordinating European Council. The lubrication requirements of European diesel engines is outlined, along with the steps in the test procedure which cover these requirements. Comparisons are made with the Caterpillar test methods.

by F. Roux; E. G. Thomas
Institut Francais du Pétrole, France; Edwin Cooper and Co., Ltd., United Kingdom
Rept. No. SAE-740668 ; 1974 ; 7p 11refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974. Sponsored by the Co-Ordinating European Council and Inst. of Petroleum.
Availability: SAE

HS-016 327

SUPER TRACTOR OIL UNIVERSAL FOR THE EUROPEAN MARKET

The history of universal lubricants is briefly reviewed, and the deficiencies of early Super Tractor Oil Universal (STOU) fluids are noted. The development of STOU additives for the latest STOU fluids is described with reference to tests in full scale tractor equipment and in acknowledged test engines. The effect of changing the base stocks is mentioned, and the advantages of the new products are discussed in terms of performance in engines to the standards of the MIL-L-2104C and MIL-L-46152 specifications, and in transmissions and wet brakes to levels that satisfy the majority of tractor manufacturers' requirements.

by R. N. Smith
Lubrizol International Labs., Hazelwood, England
Rept. No. SAE-740669 ; 1974 ; 7p
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 328

THE NATIONAL ENERGY PROBLEM--DEMAND AND CONSERVATION OUTLOOK

Studies have been made which indicate that the unconstrained daily energy demand in the U.S. will approximately double between 1970 and 1990, from 32 million bbl crude oil equivalent (COE) to 67 million bbl COE. These same studies suggest, however, that a savings of as much as 8.6 million bbl COE might be achieved by 1990 if a maximum conservation effort were to be made in the more critical consumption areas. These include the utility, transportation, industrial, commercial, and residential markets.

by C. A. Phalen
Shell Oil Co.
Rept. No. SAE-740683 ; 1974 ; 18p
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 329

WASTE OIL: A RESOURCE TO BE CONSERVED

Waste automotive and industrial oil are examined as prospective candidates for greater recycling and reclamation. Although lubricating oils represent only 1% of the total domestic petroleum production, conservation can result in significant gains. To produce this oil from new crude reserves would take an investment of perhaps \$80 million in refinery capacity and an exploration, development, and production investment exceeding \$3 billion. The present primary end uses of waste oil and the techniques required to reclaim waste oil are described. The major impediments to greater waste oil usage are analyzed, including the following factors: economics, technology, waste oil collection, government actions, and environment quality problems. Federal policy proposals are

presented to encourage more widespread reclamation of waste oil.

by M. H. Chiogioji
Federal Energy Administration
Rept. No. SAE-740684 ; 1974 ; 9p 16refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 330

COMBINATION HEAT EXCHANGERS FOR INDUSTRIAL AND AGRICULTURAL VEHICLES

Analysis of vehicle systems performance data of a radiator, air-cooled oil cooler, and air-conditioning condenser is presented. The effects of adding individual heat exchangers ahead of the radiator are reviewed with emphasis on uneven air velocities and entering air temperature changes over the heat exchangers. The improvements of combining two heat exchangers into one unit are presented, along with the effect on the total system. Improvements in manufacturing relating to reduction in cost of the combination unit are also discussed, as well as the concept of combining an air-conditioning evaporator and cab heater.

by W. Melnyk
McCord Corp., Heat Transfer Div.
Rept. No. SAE-740690 ; 1974 ; 9p
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 331

DESIGNING THE ENGINE COOLING FAN

Designing fans for engine cooling systems requires an understanding of the wind tunnel performance test, its limitations, and its correlation with installation performance. Dimensionless correlations of fan geometry and performance data provide a tool for a rational selection of the fan geometry. Materials and construction are predicted on durability considerations.

by B. R. Baranski
Wallace Murray Corp.
Rept. No. SAE-740691 ; 1974 ; 8p
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 332

ENVIRONMENTAL CONSIDERATIONS AND THE ENERGY CRISIS--THE EFFECT ON GASOLINE COMPOSITION

The current shortage of gasoline and the existence of vehicle emission standards have raised the question of what tomorrow's gasoline will be like. This paper reviews the environmental considerations and the energy supply situation, discusses the likely future processing schemes, and considers the gasoline properties expected in the future. In general, it is

held that the current processes will continue to be used and future gasolines will have properties similar to present fuels. More octane numbers will be obtained by processing than by the use of lead alkyls, which may result in more aromatics and less sulfur.

by R. S. Spindt; R. E. Kline
Gulf Res. and Devel. Co.
Rept. No. SAE-740693 ; 1974 ; 7p 14refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 333

THE DEPENDABILITY OF AUTOMATIC ENGINE TEST BEDS

A laboratory designed for both diesel and gasoline engines is described. In 1961 the engine laboratory was built, with long-term beds built with open-loop automatic control and output systems. In 1968 the function test beds were fitted with automatic reading, output, and diagram drawing systems. In 1970 the next generation of long-term test beds was built. The various systems are described. The main emphasis is on the units which have reduced dependability and the successful actions later taken to restore this dependability to an acceptable level.

by P.-S. Berg
Volvo A.B., Truck Div.
Rept. No. SAE-740696 ; 1974 ; 10p 2refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 334

FUEL DROPLET SIZE DISTRIBUTION IN DIESEL COMBUSTION CHAMBER

In order to determine spray droplet size in a diesel engine, fuel was injected into high-pressure, room-temperature gaseous environments with a diesel engine injection system. Droplet size was measured using the liquid immersion sampling technique with a mixture of water-methylcellulose solution and ethanol used as an immersion liquid for diesel fuel oil. The volume distribution of diesel spray droplets is well correlated with chi square distribution of freedom. The Sauter mean diameter increased with increasing back pressure, with the amount of fuel in a spray, and with decrease in pump speed. An empirical correlation was developed between effective injection pressure, air density, the quality of the fuel delivery, and the Sauter mean diameter of spray droplets.

by H. Hiroyasu; T. Kadota
Hiroshima Univ., Japan
Rept. No. SAE-740715 ; 1974 ; 11p 19refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974. Supported by the Combustion and Emission Res. Com. of Japan Automobile Res. Inst.
Availability: SAE

HS-016 335

A MODEL FOR THE PHYSICAL PART OF THE IGNITION DELAY IN A DIESEL ENGINE

A theoretical model for the physical part of the ignition delay period in a direct injection diesel engine is derived, based on single droplet calculations. It is used in a parametric study to examine the influence of air pressure and temperature, initial fuel temperature, and mean droplet size and velocity on the physical processes that precede the chemical reactions. The model is also used to correlate the results of an experimental investigation of the effects of using different pressures and different injection nozzles on the magnitude of ignition delay.

by P. S. Pederson; B. Qvale
Technical Univ. of Denmark, Dept. of Mechanical Engineering
Rept. No. SAE-740716 ; 1974 ; 15p 36refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 336

THE DIFFERENTIAL COMPOUND ENGINE--PT. 1: STEADY-STATE AND EMISSION CHARACTERISTICS

Comprehensive experimental results obtained with a 4-stroke diesel engine are presented. Development of the differential compound engine in its present form, with flexible, multi-variable operating controls, is given in detail. Output shaft torque and power envelopes demonstrate both constant power and implied high torque backup. The possibility of stepless transmissions or, at most, a 2-forward/reverse ratio gearbox, makes the unit particularly attractive for a wide range of transport applications.

by F. J. Wallace; K. Sivakumaran
University of Bath, School of Engineering, Bath, England
Rept. No. SAE-740721 ; 1974 ; 13p 7refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974. Supported by Perkins Engines Ltd. Pt. 2 is HS-016 337.
Availability: SAE

HS-016 337

THE DIFFERENTIAL COMPOUND ENGINE--PT. 2: TRANSIENT RESPONSE OF THE DIFFERENTIAL COMPOUND ENGINE (DCE) COMPARED WITH CONVENTIONAL TURBOCHARGED ENGINES

Experimental and analytical results for transient response of a prototype differential compound engine (DCE) are described. It is shown that the transient response of the DCE is particularly favorable due to two inherent features: the low inertia associated with the fully floating epicyclic gearbox and inherently favorable trapped air fuel ratios. Comparisons between a hypothetical DCE and a similar turbocharged engine

installed in a 24-ton truck bear on the findings on the prototype unit.

by F. J. Wallace; M. R. O. Hargreaves; D. E. Bowns; P. R. Cave
University of Bath, School of Engineering, Bath, England
Rept. No. SAE-740722 ; 1974 ; 15p 6refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974. Pt. 1 is HS-016 336.
Availability: SAE

HS-016 338

CONVERTING A GASOLINE AIR-COOLED ENGINE TO PROPANE

Conversion of an air-cooled gasoline engine to propane fuel can result in an engine with lower exhaust emissions, longer life, and less maintenance. The role of the carburetion system in mixing, the development of a novel liquid withdrawal system, and the importance of engine temperature were vital to this successful conversion.

by S. Seidlitz
Onan Corp., Onan Div.
Rept. No. SAE-740746 ; 1974 ; 8p 3refs
Presented at the National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., 9-12 Sep 1974.
Availability: SAE

HS-016 339

A REAL WORLD PERSPECTIVE ON AUTOMOBILE ACCIDENTS INVOLVING SMALL-CHILD PASSENGERS

Information useful for improving crash protection for small children was sought. Previous research efforts have produced findings relating to accident characteristics in general, and those findings have been used to improve passenger protection. Little work has focused on the particular characteristics of nonfatal and fatal accidents involving small children. This study compared accidents involving small children (age five and under) with accidents not involving small children, to establish the similarities and differences between those types of accidents. The principal findings of the study are summarized: The child is very likely a passenger in a car driven by a female between 20 and 35 years of age, who is not wearing a seat belt, and who has not been drinking. The accident, likely a frontal impact collision, occurs in daylight, most likely on a Friday. If the child is fatally injured, there is a substantial (about a 13%) chance that the collision involves non-horizontal impact forces, including a greater chance of rollover than for other fatal-accident-involved cars.

by R. M. Shortridge; J. O'Day
Michigan Univ., Hwy. Safety Res. Inst., Ann Arbor, Mich.
Rept. No. SAE-740935 ; 1974 ; 12p 4refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 340

DEVELOPMENT OF A SPINDLE FORCE-MOMENT TRANSDUCER

A recently developed vehicle spindle transducer that is capable of measuring the three components of the force vector and the two components of the moment vector that simultaneously act on a spindle are described. The transducer dimensions are 4 by 4 by 1 1/4 in (105 by 105 by 32 mm) and it weighs about 3 lb (13.5 N). It is durable and can measure with less than 4% total error. The spindle transducer fits existing suspension systems without significantly affecting vehicle geometry or dynamic response and is, therefore, the only known spindle transducer that meets all requirements for size, weight, accuracy, and strength.

by G. Z. Libertiny; J. Catz
Ford Motor Co., Dearborn Proving Ground, Dearborn, Mich.;
Miami Univ., Dept. of Mechanical Engineering, Florida
Rept. No. SAE-740938 ; 1974 ; 8p 5refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 341

FIELD DATA ACQUISITION, REDUCTION, LIFE PREDICTION, AND FIELD SERVICE CORRELATION

The overall concept and philosophy of field data acquisition and evaluation are discussed, with results from an industrial tractor component incorporated. Since the scope of the subject is so large, the major part of the discussion is centered on the method of analyzing the data and life prediction. Some methods may or may not conflict with current procedures, and are presented as only one method of evaluation.

by D. R. Hartdegen
International Harvester Co.
Rept. No. SAE-740939 ; 1974 ; 5p 1ref
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 342

TESTING VEHICLES AND COMPONENTS WITH SERVOHYDRAULIC LOAD UNITS

A servohydraulic test center for the automobile industry is described. Mechanical, hydraulic, and electronic modular components are assembled for all-purpose test facilities. The fundamental structure of a controlled system with a cylinder-servo valve combination is explained. Some measurements and the quality of the reproducibility of the simulation of random loads encountered in road testing are discussed for two special test stands for axles and driveshafts.

by J. Telschow
Volkswagenwerk A. G.
Rept. No. SAE-740943 ; 1974 ; 9p 1ref
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 343

AN UTILITARIAN APPROACH TO MIXING PHENOMENA

Effectual methodologies concerning single-phase and two-phase mixing problems which may conveniently be utilized by a design or developmental engineer are presented. For single phase, turbulent, compressible coaxial fuel and air mixing problems, an index is presented which provides a sensitive indicator for determination of the degree of mixing in a given mixing chamber. Working graphs for several hydrocarbon fuel and air stream combinations are used to demonstrate the utility of the index. The index is also shown to be of value for studying two-phase mixing such as occurring in automotive carburetors. The utility of the hydraulic analogy for studying complex mixing problems such as commonly found in automotive carburetors and manifolds, gas turbine combustors, and simple mixing chambers is further shown. Use of the hydraulic analogy technique is shown to be a fast, inexpensive method which provides a pictorial representation of flow fields. Interpretation of the flow field stream line patterns brings about an improved understanding of conditions producing pressure drops, local flow field instabilities which are possible points of noise generation, improved flow field guidance through effective use of bounding walls or deflectors, and/or of conditions affecting local heat transfer rates.

by R. F. Hurt; C. C. Meek; W. L. Hull
Bradley Univ.; Argonne National Lab.; Illinois Univ.
Rept. No. SAE-740947 ; 1974 ; 20p 181refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 344

ANALYSIS OF MOTORCYCLE ACCIDENT REPORTS AND STATISTICS. FINAL REPORT

Motorcycle accident causal factors are identified along with voids in existing motorcycle accident information, and data are provided to serve as the basis for future educational, accident data, and public information programs. The literature is reviewed and data are reported from national and Maryland statistics. Recommendations are made for both immediate and long-range programs. Regarding causal factors, suggestions are made to utilize the culpability information and the causal factors for each accident type in the design of future education and training programs as well as in the development of future accident research programs designed to reduce the frequency of these accidents through countermeasures; and to select a representative sample of other states to replicate the Maryland data base into a national data base. As for accident data voids, it is suggested that data be obtained regarding experience, headlights, speed,ometers, injury location and severity, initiation of an expansion of the Training Operators, Statewide (TOPS) programs. The basis for future programs is outlined.

by M. L. Reiss; W. G. Berger; G. R. Vallette
BioTechnology, Inc., Falls Church, Va.
1974 ; 135p 11refs
Sponsored by the Motorcycle Safety Foundation.
Availability: Corporate author

HS-016 345

PHOTOGRAPHIC AND PERFORMANCE STUDIES OF DIESEL COMBUSTION WITH A RAPID COMPRESSION MACHINE

Photographic and performance studies with a Rapid Compression Machine at Massachusetts Institute of Technology (MIT) have been used to develop insight into the role of mixing in diesel engine combustion. Combustion photographs and performance data were analyzed. The experiments simulate a single fuel spray in an open chamber diesel engine with direct injection. The effects of droplet formation and evaporation on mixing are examined. It is concluded that mixing is controlled by the rate of entrainment of air by the fuel spray rather than the dynamics of single droplets. Experimental data on the geometry of a jet in a quiescent combustion chamber were compared with a two-phase jet model; a jet model based on empirical turbulent entrainment coefficients was developed to predict the motion of a fuel jet in a combustion chamber with swirl. Good agreement between theory and experiment was obtained. The fuel and air mixing rate was estimated from the jet models and compared with combustion rates measured in the Rapid Compression Machine.

by J. Rife; J. B. Heywood
Massachusetts Inst. of Tech.
Grant NSF-GK-15409; EPA-R-800-729-03-01
Rept. No. SAE-740948 ; 1974 ; 19p 17refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974. Sponsored by the General Motors Corp.
Availability: SAE

IS-016 346

FLUID MIXING MECHANISMS APPLICABLE TO AUTOMOTIVE ENGINES

Criteria of uniformity of fluid mixing in automobile engines are discussed and a more stringent criterion suggested. The mixing length concept is developed. Fluid flow mixing models for different passage geometries are presented and evaluated for mixing length. Mixing performance of the induction system and cylinders of a typical engine are estimated. Improving mixing means are proposed and described. Maximum uniformity of distribution of the charge involves effective vaporization of fuel and mixing with the air ahead of the intake manifold. Maximum uniformity of mixture and turbulence prior to combustion involves the mixture of the trapped burned gas with the charge in the cylinders.

by C. M. Ashley
Rept. No. SAE-740949 ; 1974 ; 10p 15refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

S-016 347

HARING THE ROADWAY. MOTORISTS AND MOTORCYCLISTS IN TRAFFIC

Information is presented to help both motorists and motorcyclists in traffic. Specific tips are detailed dealing with: the difference between driving and riding; errors involved in intersection accidents; following distances and driver judgment; passing and being passed; road hazards; lane position; blind

spots; lights and signaling. Diagrams for each maneuver are included.

Motorcycle Safety Foundation, 6755 Elkridge Landing Rd., Linthicum, Md. 21090
1974 ; 17p
Availability: Corporate author

HS-016 348

INSTRUCTIONAL OBJECTIVES FOR MOTORCYCLE SAFETY EDUCATION

Instructional objectives are presented which have been prepared for use by individuals engaged in establishing, improving, or evaluating motorcycle safety education curricula. The objectives are to qualify individuals for safe operation of motorcycles on- and off-street. The program is divided into the following instructional units: basic control, safe rider practices, complex situations, off-road riding, operator fitness, and motorcycle care and servicing. The incorporation of all units into a novice motorcycle safety education program is strongly encouraged where time permits. Performance objectives are described, and the knowledge and skill objectives which support the required performance objectives are listed.

by A. J. McKnight; V. Pote
National Public Services Res. Inst.
1974 ; 40p refs
Prepared for the Motorcycle Safety Foundation, Linthicum, Md.
Availability: Motorcycle Safety Foundation, 6755 Elkridge Landing Rd., Linthicum, Md. 21090

HS-016 349

MOTORCYCLE OPERATOR LICENSING PLAN

Requirements of a proposed licensing program are reviewed, based on recommendations of a workshop the central purpose of which was to develop a plan for the measurement of motorcycle operator capabilities. The licensing program encompasses definitions of prerequisites, examination, learner's permit, operator's license, and proficiency maintenance. A knowledge test is described which includes safety criticality, relation of licensing tests and manuals, devices and equipment, standards, and updating. Skill and performance tests are covered, and program evaluation is discussed.

Motorcycle Safety Foundation, 6755 Elkridge Landing Rd., Linthicum, Md. 21090
1975 ; 47p 1ref
Workshop held in Linthicum, Md., 16-17 Oct 1974, in cooperation with the American Assoc. of Motor Vehicle Administrators and the National Hwy. Traffic Safety Administration.
Availability: Corporate author

HS-016 350

ANALYSIS OF MOTORCYCLE ACCIDENT REPORTS AND STATISTICS. A SUMMARY REPORT

This summary presents the major findings of the motorcycle accident data study. The utility of existing data sources was established and their value as a base for safety programs determined. Primary sources analyzed in the study included research literature and national and state accident computer

files. A qualitative evaluation of motorcycle accident literature and a quantitative analysis of motorcycle accident data bases were performed. Recommendations for immediate implementation offered are to utilize the culpability information and causal factor findings by accident type, for the design of training and public information efforts; and to analyze the Michigan-Illinois motorcycle accident data base in terms of operator experience and training, headlight usage, reported speed, mileage based on odometer readings, and injury location and severity. Long range programs include collection of data on both accident and nonaccident operator populations; investigations of vehicle design and rider visibility; and, the organization of field motorcycle accident investigating technicians.

Motorcycle Safety Foundation, 6755 Elkridge Landing Rd.,
Linthicum, Md. 21090
1977 ; 24p 3refs

Based on research rept. prepared by BioTechnology, Inc.,
Falls Church, Va.

Availability: Corporate author

HS-016 351

POLICIES AND GUIDELINES FOR MOTORCYCLE SAFETY EDUCATION: ON-STREET RIDERS

Guidelines for planning and administering a course of instruction in motorcycle safety education for beginning on-street operators are presented which are designed to provide suggestions for State departments of education, colleges and universities, local school systems, and other organizations. The need and responsibility for motorcycle safety education is discussed, and areas of concern include the instructional program itself, planning and administration, program personnel, leadership support, and instructional resources. Specific topics include measures of proficiency, classroom and laboratory facilities, community support, costs, insurance, scheduling, role of state departments of education, teacher preparation, team teaching, instructional media, and local resources.

by K. McPherson
American Driver and Traffic Safety Education Assoc., 1201
16th St., N. W., Washington, D. C. 20036
1974 ; 46p 11refs

Prepared in cooperation with the Motorcycle Safety
Foundation, Linthicum, Md.

Availability: Corporate author

HS-016 352

QUESTIONS ABOUT MOTORCYCLES AND SAFETY? ASK A FRIEND

Special techniques and conditions unique to safe motorcycle operation are reviewed in question and answer form in this instructional booklet. Topics covered include: differences between a street motorcycle and an off-road motorcycle; appropriate size cycle for an individual; necessary power; motorcycle education; experience need before riding in traffic; location of most accidents; carrying passengers; need for insurance and helmets; appropriate clothing; license requirements; safety checks; and means for keeping the motorcycle

in good operating condition. A glossary and personal checklist are included.

Motorcycle Safety Foundation, 6755 Elkridge Landing Rd.,
Linthicum, Md. 21090
1974 ; 18p

Availability: Corporate author

HS-016 353

SCHOOL BUS ACCIDENTS AND DRIVER AGE

The rates and types of school bus accidents were examined according to the age of the school bus driver. Data were obtained on 10,508 North Carolina drivers and an annual mileage of 74,110,890 miles. The age group mileage, number of passengers carried, and urban or rural driving exposure were related to the 1971-1972 school bus drivers involved in accidents. Sixteen year-old drivers experienced a higher accident rate on a mileage basis than any other age group. The rate then improved significantly for 17, 18, and 19-year-old drivers. The next worst record was the 20-year-old group, then the 21 through 24-year-old drivers. The 25-through 54-year-old drivers had the safest rates, comparable with the 18-year-old drivers. The oldest age group, 55 years and over, did not perform as well, but had a better record than 16-year-old, 20-year-old, and 21 through 24-year-old drivers. The 20 through 24-year-old drivers, who had the next worst record after the 16-year-olds, are a relatively small proportion of the operating drivers, and their driving record is modified by their greater exposure to traffic accidents. As these two groups, and those 55 years and over were small, differences in accident rates could not be substantiated statistically.

by J. McMichael
North Carolina Univ., Hwy. Safety Res. Center, Chapel Hill,
N. C.

1974 ; 107p 21refs

Supported by the Governor's Hwy. Safety Program.

Availability: Corporate author

HS-016 354

A STUDY OF THE VISUAL FIELDS OF NORTH CAROLINA DRIVERS AND THEIR RELATIONSHIP TO ACCIDENTS

In an effort to determine possible relationships between lateral vision and accident involvement, the visual fields of over 52,000 North Carolina drivers were measured. The results indicated that: relatively accurate visual field data can be gathered in the field by driver license examiners; less than 1% of North Carolina drivers have total visual fields of 120° or less; visual field is related to age with a higher proportion of older drivers having limited visual fields; overall two year retrospective accident experience of those with limited visual fields (140° or less) does not differ from drivers with normal fields of view (greater than 160°); when examinees are divided into five age categories, there is no significant evidence that narrower visual fields are related to higher accident involvement for any age group; and restricted visual fields may be slightly related to a higher proportion of side-collisions. While the results should not be interpreted as meaning that peripheral vision is unimportant in the operation of a vehicle, they do indicate that use of this particular tool as a driver

preciable accident savings.

by F. M. Council; J. A. Allen, Jr.
North Carolina Univ., Hwy. Safety Res. Center, Chapel Hill,
N. C.
1974 ; 42p 13refs
Supported in part by the Governor's Hwy. Safety Program and
the N. C. Dept. of Motor Vehicles as part of project entitled
"Driver License Road Testing".
Availability: Corporate author

HS-016 355

ROAD SAFETY: THE FRENCH EXPERIENCE

The efforts undertaken in France for several years to improve road safety have begun to pay off. The measures taken have been constantly backed up by scientific studies, and their cost and efficiency taken into account. The energy crisis has favorably affected the acceptance of the attitude of public powers, but this responds to the wish of most citizens, and recent experience confirms that it was the duty of public bodies to regulate and sanction offenses, since simple advice has proved unable to modify behavior. It is the alliance of information campaigns and the implementation of methods of control which has brought about the profound changes in the behavior of French car drivers ascertained over the past 2 years. More still remains to be accomplished, and the aim is to reduce the annual number killed on the roads to 10,000 within the next few years.

by C. Gerondeau
Publ: TRAFFIC ENGINEERING AND CONTROL v16 n2
1968-71, 74 (Feb 1975)
1975
Availability: See publication

IS-016 356

CHARGE: A STATE OF THE ART REPORT AND A MOST UNUSUAL ROAD TEST OF SOME ELECTRIC VEHICLES

Background of the development of electric passenger vehicles is discussed and a road testing program for electric vehicles is reviewed. Drawbacks to general public use of electric cars are mentioned, including the need for additional technology requirements. The Citicar and Elcar, both with 48-volt batteries, were tested and while capable of an approximate speed of 25 mph, after about 20 miles they began to lose power. The cars were concluded to be appropriate for extremely short distances under ideal conditions, but not for normal driving.

by J. Pashdag
Publ: MOTOR TREND v27 n3 p60-3, 108 (Mar 1975)
1975
Availability: See publication

IS-016 357

DO WE OVER-EMPHASIZING THE ALCOHOL FACTOR IN TRAFFIC CRASHES?

How blood alcohol concentration (BAC) levels are shown not to be an important factor in fatal crashes. Inclusion of those with BACs equivalent to one or two beers or a martini when

perpetuate the 50% position not only makes the problem look bigger, but in reality, exacerbates the problem. It makes the problem worse by making it less well defined and, therefore, less susceptible to countermeasure activities while at the same time straining the credibility of the whole traffic safety program and all those who work in or support that program. Real progress against fatal traffic crashes can be expected only after the problem is more clearly defined and countermeasures specifically applied.

by R. Zylman
Publ: TRAFFIC SAFETY v75 n3 p8-10, 35-6 (Mar 1975)
1975
Availability: See publication

HS-016 358

THE YEAR OF THE BIG TURNAROUND, 1974

Motor vehicle deaths decreased 17% in 1974 from 1973. The 1974 total is estimated at 46,200, compared with 55,800 in 1973. The 1972 total is the highest toll on record. In previous years, the annual changes were: 1973, down 1%; 1972, up 3%; 1971, down .2%; 1970, down 2%; 1969, up 2%; 1968, up 4%; 1967, down .2%. Statistics are cited on travel, vehicles, drivers, death rate, turnpike experience, injuries, factors affecting traffic deaths, regional changes, urban-rural fatality experience, and city and state experiences.

by J. L. Recht
Publ: TRAFFIC SAFETY v75 n3 p16-9, 28-9, 39 (Mar 1975)
1975
Availability: See publication

HS-016 359

DESIGN OF A PROGRESSIVELY TIMED SIGNAL SYSTEM

A signal system whose signals are coordinated in such a way that a car can start at one end of a street and travel at a desired speed to the other end without stopping for a red light is a progressively timed signal system. That portion of a signal cycle for which this is possible is called the bandwidth. Calculations are shown for the NO STOP-1 program, which yields bandwidths (that portion of a signal cycle for which no-stop travel is possible) larger than those produced by other methods. It is shown that cycle length and desired progression speed are the variables which influence the maximum constant bandwidth in a traffic signal system. A method has been found here whereby the Tschebyscheff Approximation is used as the best optimization model in order to maximize the bandwidth in a traffic signal system.

by H. R. Leuthardt
Publ: TRAFFIC ENGINEERING v45 n2 p11-8 (Feb 1975)
1975 ; 4refs
Availability: See publication

HS-016 360

SOME ENERGY CONSIDERATIONS IN TRAFFIC SIGNAL TIMING

The extra or incremental energy consumption resulting from the operation of traffic signals at intersections is examined.

Details are offered on the isolated pretimed intersection, with the computer simulation techniques used to augment a mathematical approach included. The calculations outlined yield three basic measures of effectiveness for a given timing scheme: total delay imparted to all vehicles passing through the intersection per unit time; average queue lengths at beginning of each green phase on each approach lane; and probabilities of vehicles stopped at intersection clearing the intersection at the first green phase. It is shown that the proportion of vehicles stopped as a function of the timing pattern used may be estimated from equations using the computed queue lengths.

by C. S. Bauer
 Publ: TRAFFIC ENGINEERING v45 n2 p19-25 (Feb 1975)
 1975 ; 7refs
 Availability: See publication

HS-016 361

WANKEL: FLYING HIGH OR DEAD DUCK?

The outlook of the Wankel rotary engine is assessed. Declining sales of the Mazda are cited, and plans of other manufacturers such as Audi, Toyota, and Datsun with regard to the Wankel are described. The Rand report on gasoline conservation, which concludes that a supercharged, stratified charge rotary engine could offer the best gasoline-saving potential of an automobile engine by 1980, is cited. Reactions to this report are examined.

by E. Maus, 3rd.
 Publ: WARD'S AUTO WORLD v11 n2 p32-4, 36 (Feb 1975)
 1975
 Availability: See publication

HS-016 362

SAE'S HARD LOOK AT ALTERNATE FUELS AND ENGINES

Alternative fuels and engines are examined in view of the energy crisis. Note is made of the importance of coal as a viable way of providing the base chemicals for plastics, thus eliminating part of the chemical industry's demand for petroleum, which could then be diverted to fueling cars. An electronic fuel injection (EFI) system could possibly increase fuel economy. Modifications to normal air fuel ratios are described. The diesel is shown to be making the greatest contribution, and its use by Opel and Peugeot is detailed. Electric and hybrid electric cars and turbine cars are evaluated, along with steam engines, and shown to have potential but many problems. It is concluded that there is a strong tendency in these research studies to concentrate too heavily on the materials, environmental, energy, and economic issues and to ignore the transportation function itself.

by R. L. Waddell
 Publ: WARD'S AUTO WORLD v11 n3 p46-9 (Mar 1975)
 1975
 Availability: See publication

HS-016 363

THE AUTO SAFETY PROGRAM: IDENTIFYING DEFECTS AND RECALLING DEFECTIVE VEHICLES

Activities of the National Highway Traffic Safety Administration (NHTSA) related to identification of safety defects and problems associated with recall of vehicles are reviewed. The manufacturer is required to notify the vehicle owner of the defect, its risk to traffic safety, and repair measures to be taken. Identifying defects in motor vehicles is considered the responsibility of both NHTSA and the manufacturer. Investigative processes for identifying safety related vehicle defects are described. Many vehicles with safety defects are still operated on the highways because all owners do not receive defect notifications, some dealers apparently sell recalled vehicles without correcting the defects, some owners simply do not return their vehicles for correction of defects, and dealers are not always prepared to service vehicles when owners bring them in for defect correction. Actions to improve recall campaigns are outlined, including a broad study to identify the major reasons defective motor vehicles are not being corrected and to determine the cost effective alternatives for improving effectiveness of recall campaigns. The feasibility of periodic motor vehicle inspections is examined, and an alternative suggestion made that it would seem more feasible to verify defect correction through State vehicle registration or licensing mechanisms.

General Accounting Office
 Rept. No. RED-75-324 ; 1975 ; 25p
 Prepared for the Senate Com. on Commerce in cooperation with the National Hwy. Traf. Safety Administration,
 Washington, D. C.
 Availability: Reference copy only

HS-016 364

PASSENGER-CAR SKIDDING AS INFLUENCED BY ROADWAY DESIGN, TIRE TREAD DEPTH, AND PAVEMENT CONDITIONS

Turnpike accident data are analyzed to show that curves of low curvature have higher than average accident involvement histories. Horizontal curvature and grade when in combination are also shown to exert independent influences on accident statistics. Tire traction is shown to be substantially degraded at water depths well below those needed for hydroplaning. Pavement drainage and hence water depth on the road surface is seen to be primarily influenced by road width, superelevation, and rainfall rate, and to be essentially independent of grade. Analytical analyses of the steady turning performance of a vehicle are used to show that cornering on a horizontal curve is essentially the same as cornering on a curve constructed on a grade, within the range of grades in common use. Computer simulation analyses involving parametric variations of vehicles, tires, road surfaces, curvature, superelevation of grade, and maneuvers are used to define specific limiting velocity boundaries for vehicle handling performance. Such boundaries are shown to be well below those which are assumed when using the AASHTO curve design formula. The accident, traction, drainage, and vehicle performance analyses are then used to formulate an expression for required pavement skid number. The formulation, including the influences of curvature, grade, pavement drainage, legal tire tread depth, skid

number gradient and roadway design velocity, is developed in the appendix. Examples are used to illustrate applications.

by D. F. Dunlap; P. S. Fancher, Jr.; R. E. Scott; C. C. MacAdam; L. Segel

Contract Ref: NCHRP-HR-1-14

Publ: HIT LAB REPORTS v5 n4 p1-20 (Dec 1974)

1974 ; 17refs

Based on "Influence of Combined Highway Grade and Horizontal Alignment on Skidding," by the Hwy. Safety Res. Inst., Michigan Univ., Ann Arbor, Mich.
Availability: See publication

HS-016 365

EFFECT OF FRICTIONAL HEATING ON BRAKE MATERIALS

Materials and their properties for use in aircraft brakes are examined in a program whose overall objective is to develop improved brake materials primarily from a safety point of view. Improvements possible in present materials were studied. Primary consideration was given to heat dissipation. Used brake pads and rotor disks, taken from aircraft at overhaul, were analyzed to provide additional information on material behavior. A simplified analysis was conducted in order to determine the most significant factors which affect surface temperature. Where there are size and weight restrictions the specific heat and maintaining the contact area appear to be the most important factors. A criterion is suggested for determining the number and thickness of brake disks, within the limited space available in a wheel, to provide an optimal compromise between effective surface temperature of the disk and weight. For lower surface temperatures maximum benefit can be obtained by using materials of high specific heat (and density) and by maximizing the contact area.

by T.-L. Ho; M. B. Peterson; F. F. Ling
Grant NGR-33-018-152

Publ: WEAR v30 n1 p73-91 (Oct 1974)

1974 ; 6refs

Availability: See publication

HS-016 366

TODAY'S ENGINES IN TOMORROW'S WORLD

Fundamental changes to the internal combustion engine brought about by the fuel crisis are examined. The necessity of finding economical cars is stressed. Political aspects of the problem are mentioned. Two immediate goals are identified: to produce much more efficient engines, taking into account the probable cost and availability of fuel as well as the impending clean-air legislation of all the industrial nations; and to find fairly quickly alternative sources of energy for off-the-road application. Various alternative engines are described, including the Wankel rotary, steam cars, the GAZ 52 stratified charge engine, the Warren engine, diesel engines, and turbochargers.

by C. Goodacre

Publ: AUTOCAR v142 n4084 p34-7 (1 Feb 1975)

1975

Availability: See publication

HS-016 367

WEAR MECHANISMS FOR ASBESTOS-REINFORCED AUTOMOTIVE FRICTION MATERIALS

An asbestos-reinforced automotive friction material was evaluated by dynamometer testing for its wear characteristics at elevated temperatures. Wear rate constants were obtained for different temperatures, and an activation energy was obtained for the high-temperature wear process. It is concluded that the wear is controlled by a pyrolysis mechanism at elevated temperatures (above 450° F drum temperature) and by adhesive and abrasive mechanisms at low temperatures.

by S. K. Rhee

Publ: WEAR v29 n3 p391-3 (Sep 1974)

1974 ; 5refs

Availability: See publication

HS-016 368

FRONTAL CRASH EVALUATION TESTS OF THE GM CHILD SEAT HARNESS

The mechanism and efficacy of the General Motors Child Seat harness configuration have been tested using animal models in crash sled experiments. The purpose of the tests was to answer additional questions about child restraint which have arisen since the introduction of the seat. Results of the 32.2, 40.2, and 48.3 km/h (20, 25, and 30 mph) frontal barrier crashes have confirmed the safety of the seat harness on the closest animal surrogate to the human child. There were no significant injuries to the test animals. Special techniques were devised and used in examining the subjects for trauma in order to dispense with the usual procedure of post-test sacrifice and autopsy. As a result, the healthy animals were donated to the primate colony of the Detroit Zoological Society after completion of the experiments.

by R. M. Schreck; L. M. Patrick

General Motors Res. Labs., Geomedical Science Dept., Warren, Mich. 48090; Wayne State Univ., Dept. of Mechanical Engineering Sciences, Detroit, Mich. 48202

Rept. No. GMR-1780 ; 1975 ; 63p 24refs

Availability: General Motors Research Laboratories, Warren, Mich. 48090

HS-016 369

EFFECT OF CURB GEOMETRY AND LOCATION ON VEHICLE BEHAVIOR

The safety aspect of curb use is examined in view of minimal data already available in the literature. Three commonly used curb types, two 6 in. and one 4 in. high, and a special configuration 13 in. high were investigated through the use of the Highway Vehicle Object Simulation Model. The applicability of the model was evaluated by 18 full-scale tests on the two 6-in. high curbs. A series of nine tests at vehicle speeds of 30, 45, and 60 mph, and approach angles of 5, 12.5, and 20 degrees, were conducted on each curb type. Such vehicle responses as redirection, trajectory, path, roll and pitch, and acceleration were observed and evaluated. The model results were found to correlate well with the full-scale results, and its applicability as a tool for evaluating vehicle response to a wide range of curb configurations appears to have been validated. The findings of the study suggest that curbs of the configura-

tions tested have no redirection capabilities to enhance safety in a high-speed travel environment, and some may even reduce safety, especially when a curb guardrail combination exists, by causing vehicle ramping. The evaluation process described may also be found to have application in optimizing the redirection capabilities of curbs that may be appropriate for use in low- to moderate-speed environments more typical of urban areas.

by R. M. Olson; G. D. Weaver; H. E. Ross, Jr.; E. R. Post
Texas Transportation Inst., Texas A and M Res. Foundation,
College Station, Tex.
Rept. No. NCHRP-150 ; 1974 ; 98p 20refs
Sponsored by the American Assoc. of State Hwy. and
Transportation Officials in cooperation with the Federal Hwy.
Administration
Availability: TRB, \$4.80

HS-016 370

WARRANTS FOR HIGHWAY LIGHTING

The problems associated with nighttime visibility and highway illumination were studied. A conceptual framework was established considering the purpose of lighting itself—to improve the efficiency of night visual communications on traffic facilities through provision of informational needs. These were developed to correspond with the basic levels of driver performance: positional level (routine steering and/or speed adjustments); situational level (change in speed, direction of travel, or roadway position, resulting from a change in geometric, operational, and/or environmental situation); and navigational level (selecting and following a route from the origin to the destination of a trip). Driver performance at each level affects performance at the others. Geometric, operational, and environmental conditions were used as parameters for traffic facility evaluation as to lighting needs and minimum warranting conditions. The traffic facility classification method developed is a quantification of traffic conditions, geometric conditions, environmental conditions (locational), and accident potential, as well as accident history. A positive method for determining the design level of lighting intensity is suggested, quantitatively related to the magnitude of warranting conditions and, thus, to visual information needs. Cost effectiveness was determined as the only method available for economic analysis of roadway lighting. This research suggests that benefits or effectiveness be measured in terms of supplying informational needs. The magnitude of warranting conditions on a given facility, which are dependent on the magnitude of informational needs, serves as the effectiveness measure in priority determination. A priority model was developed based on lighting effectiveness, vehicles or people served, light intensity, size of facility, and annual costs. It is concluded that the total design process is a usable technique, and its use is illustrated through typical examples taken from field study sites.

by N. E. Walton; N. J. Rowan
Texas Transportation Inst., Texas A and M Univ., College
Station, Tex.
Rept. No. NCHRP-152 ; 1974 ; 127p 99refs
Sponsored by the American Assoc. of State Hwy. and
Transportation Officials in cooperation with the Federal Hwy.
Administration
Availability: TRB, \$6.40

HS-016 371

NEW YORK STATE ACCIDENT FACTS '74. AN ILLUSTRATED ANALYSIS OF 1973 MOTOR VEHICLE ACCIDENT RECORDS

Statistics for motor vehicle accidents in New York State in 1974 are presented. The charts deal with: 20-year summary; death and injury accident rates; reportable motor vehicle accidents, 1934-1973; age distribution of people killed and injured; seriousness of injury; manner of collision; directional analysis and diagrams; pedestrian action diagrams; age distribution of pedestrians killed and injured; drivers involved in accidents; road system and factors; light and weather conditions; traffic control; accidents by hour of day and day of week; accident involvement by type of motor vehicle; bicycle accidents; and additional statistics on New York City, urban, rural, and county accidents.

New York State Dept. of Motor Vehicles, Empire State Plaza,
Albany, N. Y. 12228
1974 ; 37p
Availability: Corporate author

HS-016 372

EFFECTS OF SUSPENSION DESIGN ON THE ATTITUDES OF A CAR DURING BRAKING AND ACCELERATION

Two degrees of freedom models of a car are employed to demonstrate the effects of a suspension derivative on the pitch and bounce attitudes during braking or accelerating. The work equation is employed to show that brake effort distribution between the axles has a significant effect on the attitudes when anti-dive suspension characteristics are utilized. The steady-state positions in both pitch and bounce are developed for linear systems of typical suspensions that may be either standard or coupled systems. Non-linear systems are considered using simulation techniques. A description of some simulation circuits is contained in an appendix.

by J. R. Ellis
Publ: INSTITUTION OF MECHANICAL ENGINEERS
PROCEEDINGS v187 n58/73 p787-94 (1973)
1973 ; 6refs
Availability: See publication

HS-016 373

PULSE CONVERTERS--A METHOD OF IMPROVING THE PERFORMANCE OF THE TURBOCHARGED DIESEL ENGINE

The operation and application of the pulse converter is examined in detail. Test results from three completely different types of engines showed substantial improvements in performance. The dependence of the pulse converter on engine speed and load, the effect of area variations in the pulse converter and the timing of the interfering exhaust pressure waves have been studied. A comparison of theoretically predicted and measured transient pressures (from a model pulse converter fitted to a pulse generator) was made. The theoretical analysis is based on empirical steady-flow loss coefficients and forms a boundary condition for a method of characteristics

analysis. Results are compared with those predicted by the simple constant-pressure theory.

by M. S. Janota; N. Watson
 Publ: INSTITUTION OF MECHANICAL ENGINEERS
 PROCEEDINGS v187 n51/73 p635-47 (1973)
 1973 ; 18refs
 Availability: See publication

HS-016 374

HEAT THERMAL LOADING OF A PETROL ENGINE

The results of an investigation into the thermal loading of a modern 1.975 l, four-cylinder petrol engine operating at engine speeds of up to 100 rev/s are reported. The effects of engine speed and load, mixture strength, ignition advance, compression ratio, coolant temperature and pressure, antifreeze, detonation, olefin content of fuel, and a piston modification on the local heat fluxes and metal temperatures have been determined and the maximum levels established. The methods of temperature measurement were: fixed and traversing thermocouples for the cylinder head and liner, fixed thermocouples for the valve seats and spark plug, disappearing filament optical pyrometer and hardness recovery for the exhaust valve, differential thermocouples for the gross heat losses, and intermittent-contact fixed thermocouples for the piston. The greatest heat fluxes occurred at the center of the combustion chamber, in the valve bridge and exhaust valve seat region, and decreased towards the outside of the combustion chamber and down the cylinder liner. For the form of combustion chamber investigated the heat flux varied as the 0.6 power of the gross fuel consumption and the operating variables generally gave only second-order effects. The piston temperature is fairly sensitive to ignition advance, compression ratio, and high-speed detonation.

by C. C. J. French; K. A. Atkins
 Ricardo and Co. Engineers (1927) Ltd., Bridge Works,
 Shoreham-by-Sea, Sussex, England
 Publ: INSTITUTION OF MECHANICAL ENGINEERS
 PROCEEDINGS v187 n49/73 p561-73 (1973)
 1973 ; 10refs
 Sponsored by Vauxhall Motors' Ltd., A. C. Delco Ltd., British Petroleum Co. Ltd., and Hepworth and Grandage Ltd.
 Prepared for presentation at an Ordinary Meeting of the Automobile Div. of the Inst., London, 18 Oct 1973.
 Availability: See publication

HS-016 375

DESIGN TRIAL BY ORGANIZATION AND ORDEAL: AN ENGINEER'S SEARCH FOR QUALITY

The organization of a design and development team and the operation of a controlled and audited test program are discussed, the ultimate goal being quality and reliability of the product. The design and development team headed by the chief product engineer should have four major components: the project manager, the chief designer, the test engineer, and the tooling control manager. Their individual functions are discussed. Life testing of various components and the building of sufficient prototypes to prove the practicability of the product can all be achieved on the premises by means of various rigs as described, but the real evidence of the success of the product can be achieved only by thousands of miles of ac-

tual running on a well-equipped proving ground. Its requirements are discussed.

by J. H. Alden
 Vauxhall Motor Ltd., Environmental Activities Staff, P.O.
 Box No. 3, Luton, Beds., England
 Publ: INSTITUTION OF MECHANICAL ENGINEERS
 PROCEEDINGS v187 n46/73 p501-14 (1973)
 1973
 Prepared for presentation at an Ordinary Meeting of the Automobile Div., London, 2 Oct 1973.
 Availability: See publication

HS-016 376

A COMPARISON OF THE SAFETY POTENTIAL OF THE RAISED VERSUS DEPRESSED MEDIAN DESIGN

The safety benefits of the mound (raised) median design as compared to the swale (depressed) median design for interstate highway medians having an 84-ft (25.6-m) design width are examined. The effects of each median design on the frequency and severity of median-involved single-vehicle accidents, on the path of the encroaching vehicle, and on the vehicle's tendency to overturn were studied. Approximately 130 miles (209 km) of four-lane, divided highway with each median design were studied, and the accident experience from 1969 through 1971 analyzed. The results indicated that the 84-ft median of either cross-sectional design provides a generally adequate recovery area for encroaching vehicles, although the swale median appears to provide more opportunity for encroaching vehicles to regain control and return to their roadway. The use of either cross-sectional design for medians of this width has no effect on the primary path of the vehicle, on the vehicle's tendency to overturn, or on the resulting severity of the accident when a median encroachment results in a reported accident.

by T. J. Foody; T. B. Culp
 Publ: TRANSPORTATION RESEARCH RECORD n514 p1-15 (1974)
 1974 ; 4refs
 Sponsored by the Com. on Operational Effects of Geometrics. Includes discussion by H. L. Anderson (Federal Hwy. Administration) and J. C. Glennon (Midwest Res. Inst.) and author's closure.
 Availability: See publication

HS-016 377

CASE STUDIES OF WRONG-WAY ENTRIES AT HIGHWAY INTERCHANGES IN VIRGINIA

A two-year survey of wrong-way driving was evaluated and led to on-site investigations of a number of intersections and interchanges. The investigations showed a consistent pattern in wrong-way entry incidents that related to road geometrics, markings, and signs. Based on the findings of the investigations, five case studies were developed to show the effects of these variables. This paper discusses the results of the survey, some case studies, and measures for preventing wrong-way entries at selected interchanges. Some of the recommendations include: channelize the left lane of the exit ramp and remove the left end flare; investigate the effectiveness of stop lines, the continuation of pavement edge lines across exit ramps, and the use of continuous double yellow lines; through the use of signs, provide intersection geometry information for drivers

HS-016 378

entering a four-lane divided highway; and provide additional pavement marking and spotlighting to supplement signs.

by N. K. Vaswani

Publ: TRANSPORTATION RESEARCH RECORD n514 p16-28 (1974)
1974 ; 9refs

Prepared in cooperation with the Virginia Hwy. Res. Council, and sponsored by the State of Virginia and the Com. on Operational Effects of Geometrics.

Availability: See publication

HS-016 378

RESEARCH ON TRAFFIC LAW ENFORCEMENT: EFFECTS OF THE ENFORCEMENT OF LEGISLATION ON ROAD USER BEHAVIOUR AND TRAFFIC ACCIDENTS

Enforcement is a crucial factor in many road safety measures. The philosophy underlying traffic law enforcement is that compliance with traffic regulations will effect the safe and efficient movement of all road users. As the effectiveness of enforcement action is open to question and because of the large costs and administrative problems involved, policy decisions in this area are especially difficult. An overview of the major elements in the traffic law enforcement system is given, and a survey of national practice is included. A comprehensive review of research on the effects of enforcement of legislation on traffic offenses only, traffic accidents only, and both traffic offenses and accidents is carried out and the findings summarized. Research presently being undertaken is indicated. Guidelines based on the present state of the art and the collective expertise and experience of the group are set out and future research needs are identified. Aspects covered include the police, courts, road user, and traffic enforcement systems.

Organisation for Economic Co-Operation and Devel., 2, Rue Andre-Pascal, 75775 Paris Cedex 16, France
1974 ; 111p 238refs

Availability: Corporate author, \$5.00

HS-016 379

DIFFERENTIAL COMPOUND ENGINE. 2ND PAPER

The overall performance characteristics of the differential compound engine, designed to constitute an integrated engine-transmission system providing high unit output combined with outstanding torque characteristics for traction applications, are assessed. Experimental results, for both equilibrium conditions and transient response are presented for the original two-stroke c.i. version of the laboratory unit, incorporating the Rootes TS 3 opposed piston engine. Theoretical predictions both for this version and the later four-stroke version, using the Perkins 6-354 engine, based on the generalized computer approach of an earlier paper, are also presented. The unit is then critically compared with existing or prospective traction prime movers using the following criteria: fuel economy, torque characteristics, noise and emission, and unit specific weight and bulk. A projected automotive unit of approximately 2 hp shaft output is described with illustrations to show the potential of the differential compound engine as an alternative

HSL 75-9

engine-transmission system for heavy trucks and off-highway vehicles.

by F. J. Wallace

Publ: INSTITUTION OF MECHANICAL ENGINEERS PROCEEDINGS v187 n48/73 p548-60 (1973)
1973 ; 18refs

Sponsored by the Military Vehicles Experimental Establishment, Chertsey, and the Perkins Engine Co.
Availability: See publication

HS-016 380

AN EVALUATION OF CATALYTIC CONVERTERS FOR CONTROL OF AUTOMOBILE EXHAUST POLLUTANTS. CONSULTANT REPORT

The status of catalysts for automobile emission control was assessed, and future developments in catalytic converters, especially for oxides of nitrogen removal, are estimated. Data were gathered from site visits to most domestic automobile producers and potential catalyst suppliers, as well as from the literature, material presented at technical meetings, and assessments based on experience in catalysis. The basic performance of the various systems, catalysts, and testing methods are reviewed. Durability data are examined, and factors discussed are those that can lead to catalyst deactivation; e.g., thermal effects, chemical poisons, physical attrition, and poisoning blockage. The sulfate formation and possible toxicological effects of debris emitted from the converters are also evaluated along with mathematical modeling studies and what is known about the kinetics and mechanisms of the various reactions.

by J. W. Hightower; J. B. Butt; D. F. Ollis; H. Wise
Committee on Motor Vehicle Emissions, National Academy of Sciences, Washington, D. C.
1974 ; 126p 97refs

Prepared for the Environmental Protection Agency, Office of Mobile Source Air Pollution Control, Washington, D. C. 20460
Availability: Corporate author

HS-016 381

NATIONWIDE PERSONAL TRANSPORTATION STUDY. REPORT 11. AUTOMOBILE OWNERSHIP

Data compiled from the Nationwide Personal Transportation Survey concerning the variables affecting household automobile ownership are presented, representing the most complete national overview to date. Data were used to study the effect of selected variables on car ownership. Car ownership is related to such household characteristics as place of residence of principal driver by incorporated places and unincorporated areas and size of the standard metropolitan statistical areas and income and household composition including number of occupants and number of licensed drivers. Car ownership is also related to characteristics of the automobile including age of the automobile and automobile ownership rates by place of residence and household income. Finally, car ownership is related to characteristics of vehicle trips and vehicle miles of travel and person trips and person miles of travel. Daily trip generation rates and miles of travel per household are included.

by R. H. Asin; P. V. Svercl
Federal Hwy. Administration, Office of Hwy. Planning, Washington, D. C.

1974 ; 76p
Availability: Corporate author

DRIVERS LICENSE GUIDE 1975

A full-color drivers license manual is presented which describes and provides photographs of current licenses for Canadian provinces and American states, also Puerto Rico. Military extension policies are detailed, along with means of detection of altered licenses. Credit card information is given for national credit agencies, and the Soundex system for assigning license number to individuals is explained. Examples of state license plates are also included.

Drivers License Guide Co., 1492 Oddstad Dr., Redwood City, Calif. 94063
1975 ; 81p
Availability: Corporate author

HS-016 383

COMPULSORY SEAT BELTS: A SURVEY OF PUBLIC REACTION AND STATED USAGE

Eighteen months after seat belt use became mandatory in New South Wales, 1251 people were interviewed in Sydney on their seat belt usage and attitudes. This survey was a repeat of a survey taken prior to the law with a comparable sample. The followup survey was designed to determine the extent to which the law had influenced wearing habits and attitudes. Reported wearing rate increased dramatically. In 1973 75% of the people reported always wearing a seat belt, compared to only 25% in 1970. Only 10% reported rarely or never wearing one in 1973, compared to 50% in 1970. This high level of compliance with the law was found in every sub group examined. Attitudes expressed by respondents indicated that seat belts are now fully accepted by the majority of the community. After the law, people were more likely to believe seat belts to be important to safety and negative attitudes were rare. In addition, 80% of the people were in favor of the law. Reasons for the law's impact on behavior and attitudes, the relevance of enforcement activity and the future role of propaganda are discussed in the light of these survey results.

by K. Freedman; R. Wood; M. Henderson
New South Wales Dept. of Motor Transport, Traffic Accident Res. Unit, Box 28, G.P.O., Sydney, Australia 2001
Rept. No. 9/74 ; 1974 ; 35p 5refs
Availability: Corporate author

HS-016 384

HYDRAULIC BRAKES: HOW AND WHY

The technology of hydraulic brakes is reviewed with specific diagrams included of the mechanics involved. It is shown that the demands of safety and the different pressure requirements of discs and drums have made more sophisticated and more fail-safe systems necessary. Pressure is the same at all places in the circuit, while the mechanical force generated depends upon the area of the piston. The dual master cylinder is described along with combination valves and disc/drum combinations which require hydraulic system modifications.

by B. Freudenberg
Publ: MOTOR SERVICE p36, 42, 46, 50, 52 (Mar 1975)
1975
Availability: See publication

STATEMENT BEFORE THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, PUBLIC MEETING, DOCKET 74-11, NOTICE 6; DOCKET 73-19, NOTICE 4, BUMPER STANDARD, FEBRUARY 18, 1975

Data and crash test results are presented which document the dramatic effectiveness to the American consumer of the present and proposed 5 mph standard against safety damage to cars in front and rear barrier contacts, and the ineffectiveness to the public of the planned 2.5 mph standards. The data show that: the present 5 mph safety-related bumper standard has provided long-needed, previously unavailable protection to American car owners from wasteful, hazardous disruption of their cars' safety performance; the present 5 mph standard also has provided new car owners with bumper systems that greatly reduce the wasteful, costly damage incurred by earlier-year model cars in everyday, very low-speed crashes; the present 5 mph standard already meets the property damage bumper standard proposed by DOT (Aug. 1973) forbidding repair damage in 5 mph front and rear barrier contacts (a proposal that DOT now wants to abandon); some manufacturers have met the present 5 mph safety-related bumper standard with lightweight bumper systems that also already meet the proposed 5 mph property damage standard; the DOT planned 2.5 mph safety related bumper standard is held to be a sham, reflecting the bumper performance of the 1972-model new cars as they were being designed and produced before any federal standard at all was in effect. It is suggested that the DOT contention that the current requirements are not cost beneficial is a basic misstatement.

by W. Haddon, Jr.
Insurance Inst. for Hwy. Safety
1975
Availability: Corporate author

HS-016 386

THE ROLE OF LICENSING AND TRAINING IN MOTORCYCLE SAFETY

The growth trends in motorcycle usage and resulting accidents are reviewed, along with causes and effective countermeasures. The causes of accidents are identified primarily as driver failure to sight oncoming motorcyclists and judge range or closing speed, and cyclists' loss of control. A suggested program for licensing is outlined which includes first a learner's license, restricting the operator with regard to unsupervised operation in areas designated at less than 35 mph, without passengers, by day, and on a motorcycle of less than 150 cc clearly marked by a high-reflectance Learner Operator plate or other distinctive marking. After 30-90 days, the candidate should be subjected to a test involving operation in traffic, carriage of passengers, night operation, adverse conditions, and emergency procedures. It is concluded that such a program would be expensive but justifiable.

by S. Munro
Road and Motor Vehicle Traffic Safety, Ministry of Transport, Transport Canada Bldg., Place de Ville, 27th Floor, Ottawa, Ont., Canada K1A 0N5
1974 ; 11p 24refs
Presented to the Com. of the Legislature on Traffic Safety, Government of Saskatchewan.
Availability: Corporate author

HS-016 387

HS-016 387

THE DEVELOPMENT OF A NATIONAL MOTORCYCLE TRAINING PROGRAM

The remarkable increases in motorcycle registrations, accidents, injuries, and fatalities in North America over the last 10 years is reviewed. An attempt is made to determine the underlying causes of these accidents by reviewing available literature. There appears to be general agreement by authorities in the field of motorcycle safety that the problems are amenable to corrective action. On the basis of cost-effectiveness, training and education rate highly as prime countermeasures. The development of the Canadian National Motorcycle Training Program under the auspices of the Canada Safety Council is described, and the methods and techniques are discussed.

by S. Munro
Road and Motor Vehicle Traffic Safety, Ministry of
Transport, Transport Canada Bldg., Place de Ville, 27th Floor,
Ottawa, Ont., Canada K1A 0N5
1974 ; 12p 28refs
Presented at the Scientific Sessions of the American Assoc.
for Automotive Medicine Annual Conference, Toronto,
Canada, 13 Sep 1974.
Availability: Corporate author

HS-016 388

THE DEADLIEST VEHEMENCE. A PAPER ON MOTORCYCLE SAFETY

Increases in registrations and accidents involving motorcycles in Canada are reviewed. The vehicle itself is described in terms of criticism, noise, stability, danger, disadvantages and advantages, and problems. Causes of accidents are identified, including operator attitude, experience, and licensing legislation. Primary and secondary safety are also assessed, such as information programs, attitude, experience, training, licensing, initial vehicle training, counselling, coordination and operator safety. Recommendations for a training and licensing program are outlined.

by S. Munro
Road and Motor Vehicle Traffic Safety, Ministry of
Transport, Transport Canada Bldg., Place de Ville, 27th Floor,
Ottawa, Ont., Canada K1A 0N5
1967 ; 25p 14refs
Availability: Corporate author

HS-016 389

MOTORCYCLE TRAINING PROGRAM

A Canadian program is described which attempts to develop attitudes based on the knowledge that the motorcyclist is totally vulnerable, that collision or upset are to be avoided at all costs, and on the fact that the motorcyclist is invisible. The next objective is skill. The cyclist must be able to operate his vehicle competently and with confidence on all surfaces and under all conditions he may be expected to encounter. The novice must be drilled in making quick decisions and to be

able to take fast and effective decisions.

by S. Munro
Road and Motor Vehicle Traffic Safety, Ministry of
Transport, Transport Canada Bldg., Place de Ville, 27th Floor,
Ottawa, Ont., Canada K1A 0N5
1974 ; 10p 31refs
Presented at the Canada Safety Council Conference, Toronto, 6 Oct 1974.
Availability: Corporate author

HS-016 391

SAFETY ASPECTS OF TRAFFIC

The degree of increased highway speed limit is examined. The drop in speed and in total, in the fuel energy crisis (October 1974) accidents and fatalities have increased since the end of the fuel shortage. The 55 mph speed limit which since March, 85th percentile from 63 to about 65 mph. At this point, there is some justification for a speed limit on the Michigan majority of drivers average 65 mph. In other important aspects of such as the nation's commitment to a policy to support the energy conservation is no longer, it is recommended that speed limit subject to further speed and accident trends. If future selected changes in speed limit recommendations will be made at the

by N. Enustun; D. A. Hornbec
Michigan Dept. of State Highways, P. O. Drawer K,
Rept. No. TSD-295-74 ; 1974 ; 10p
Availability: Corporate author

HS-016 392

INTERNATIONAL AUTOMOTIVE CONFERENCE PROCEEDINGS CANADA, OCTOBER 22-24

Conference presentations are and performance properties of effect on the tire/vehicle system components as well as consumer educational efforts are also discussed.

National Hwy. Traffic Safety Association, Automotive Engineers, Inc.
Contract DOT-HS-4-00944
1974 ; 208p refs
Includes HS-016 393--HS-016 411
Availability: SAE

TIRE EVOLUTION

The evolution of vehicle tires from the mid-nineteenth century to the present is reviewed. Basic design, carcass materials, manufacturing techniques, tire dimensions, comfort and noise criteria, and recent construction types are discussed. Special consideration is given to increased tire volume, reduced inflation, increased durability, and tread patterns. It is concluded that because of the multiplication of performance and environmental requirements and the large number of tires, wheels, and support components in service, overall performance gains in the near future will not be as great as in the past.

by W. W. Curtiss

Goodyear Tire and Rubber Co.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p8-16

1974

Conference held in Toronto, Canada, 22-24 Oct 1974.

Availability: In HS-016 392

HS-016 394

EVOLUTION OF VEHICLES

The history of automobile development is briefly reviewed, with note taken of significant inventors and events. The need for understanding the complex interrelationship between tire-vehicle-road and the driver in order to improve safety is cited. European and American philosophies are compared, as well as the impact of the two world wars upon the development of the automobile.

by J. K. Nemeth

American Motors Corp.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p17-8

1974

Conference held in Toronto, Canada, 22-24 Oct 1974.

Availability: In HS-016 392

HS-016 395

ROAD DEVELOPMENT THROUGH THE YEARS

The measurement of traction capacity of roads is examined. Government agencies and private industry are working together to provide meaningful parameters in measuring road traction capacity. Past history, present problems, and the direction of traction measuring technique are covered in detail. An important recent development has been the establishment by the Federal Highway Administration of three field test and evaluation centers. These centers will provide evaluation, calibration, and standardization services to state highway departments and other agencies owning measurement systems used to rate the skid resistance of highway pavements.

by E. A. Whitehurst

Ohio State Univ.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p19-24

1974 ; 28refs

Conference held in Toronto, Canada, 22-24 Oct 1974.

Availability: In HS-016 392

THE DRIVER--EIGHTY YEARS OF EVOLUTION

An account of the early casual training methods for drivers and how these methods have developed over the years is discussed. The need for a nationwide uniform set of rules regulating drivers and motor vehicles, replacing the present patchwork of state rules and regulations, is noted. The history of the driver's license is traced, and the confusing complexity of rules unique to individual states is deplored. The need for driver education courses for young people, the most accident prone, is stressed. The present driver education courses are based on minimal standards of training. The need is for a system to prepare drivers and evaluate their abilities to operate a motor vehicle in the driver-vehicle-road system.

by R. A. Whitworth

General Motors Corp.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p25-7

1974

Conference held in Toronto, Canada, 22-24 Oct 1974.

Availability: In HS-016 392

HS-016 397

RECOMMENDATIONS AND REGULATIONS (TIRE INDUSTRY)

Self-imposed, customer, and governmental regulations in the tire industry are discussed from the point of view of the replacement tire manufacturer. A comparison is made between the original equipment manufacturers and the replacement tire manufacturer with regard to their relative economic roles in the tire industry. Past efforts of the tire industry to regulate itself are described, and the character and problems of the 100% replacement tire manufacturer are considered. The concern they have with the effect of regulations on the profitability and longevity of their business is also discussed.

by C. F. Schwall, Jr.

Armstrong Rubber Co., Res. and Devel. Div.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p28-30

1974

Conference held in Toronto, Canada, 22-24 Oct 1974.

Availability: In HS-016 392

HS-016 398

THE EFFECTS OF TIRE WEAR ON VEHICLE BEHAVIOR

The cornering characteristics during the progress of tire wear and how the stability and controllability of a vehicle varies in the various stages of tire wear are discussed. With the introduction of tire parameters appropriate to represent the characteristics of tire construction, the method of calculation of the cornering characteristics of a tire is proposed. The values of tire parameters are shown in the various stages of

tire wear in cases of both bias belted and radial tires on dry surface only.

by S. Tsuchiya; T. Watanabe; Y. Matsuoka
Toyota Motor Co. Ltd.
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p31-40
Rept. No. SAE-741100 ; 1974 ; 4refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 399

A METHOD FOR THE EVALUATION OF THE LATERAL STABILITY OF VEHICLES AND TIRES

Some concepts regarding the forces and the moments which act on a tire are outlined, and some general characteristics of indoor cornering force machines, along with their limitations, are examined. A method is presented for measuring tire-vehicle curves on a steering pad. The method, based on experience obtained by the use of mathematical models, permits a quantitative evaluation of the stability and the steering of a vehicle under steady state working conditions, on both wet and dry tracks. It is shown that certain aspects of the vehicle behavior in transient conditions may be deduced from the data obtained. The method is valid for both cars and two-axle trucks and it is illustrated with some examples.

by F. Celeri; A. Chiesa
Industrie Pirelli S.p.A., Italy
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p41-9
Rept. No. SAE-741101 ; 1974
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 400

THE INFLUENCE OF TIRE WEAR ON STEERING PROPERTIES AND THE CORRESPONDING STRESSES AT THE TREAD-ROAD INTERFERENCE

Data showing the effects of the state of wear, structure, load, and inflation pressure on the cornering stiffness and aligning torque stiffness of typical passenger tires are presented. A method is introduced and applied for assessing contributions of local elements of the tread interface to the cornering force, the cornering stiffness, the aligning torque, and the aligning stiffness. There is also a further identification of the contributions to the aligning torque from fore and aft interfacial stress distributions and from lateral stress distributions. Pneumatic trail is redefined in the light of the interfacial measurements, and values are established for various operating conditions, states of wear, and tire types.

by S. A. Lippmann; K. L. Oblizajek
Uniroyal, Inc.
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p50-69
Rept. No. SAE-741102 ; 1974 ; 20refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 401

GENERAL MOTORS TIRE PERFORMANCE CRITERIA (TPC) SPECIFICATION SYSTEM

Part of the General Motors Tire Program is described which outlines the reasoning behind the establishment of the Tire Performance Criteria (TPC) Specification System and system itself. All TPC specifications are included in an appendix. The specific objectives of this system were to provide General Motors Corporation with improved specifications original equipment tires to assure that all the suppliers' tires are equal to or above the specified minimum performance levels, and to provide the customer with a system by which could obtain replacement tires designed to provide the same performance characteristics as the original equipment tires originally installed on his vehicle. Specifications are given dimensions, endurance, high speed, traction (wet, dry, snow), passby noise, force and moment characteristics, uniformity, and balance, with details as to how and why they were developed.

by K. G. Peterson; F. D. Smithson; F. W. Hill, Jr.
General Motors Proving Ground, Tire and Wheel Engineering
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p70-80
Rept. No. SAE-741103 ; 1974 ; 6refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 402

UNDERSTANDING TIRE INTERMIX THROUGH TIRE CORNERING COMPLIANCE CONCEPT

Factors contributing to the directional control dynamics of motor vehicles are discussed. The cornering compliance concept is particularly applicable to the tire intermix situation since it helps to separate the front and rear contribution to total vehicle performance. The relationship between cornering compliances and vehicle response properties is reviewed. Contribution of tire mechanical properties to cornering compliance is described. Typical compliance levels associated with intermix of generic tire types, wear states, and brands are listed.

by R. L. Leffert; P. M. Riede; R. E. Rasmussen
General Motors Proving Ground, Vehicle Dynamics Laboratory
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p81-90
Rept. No. SAE-741104 ; 1974 ; 15refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 403

DRIVING SIMULATOR STUDIES: THE INFLUENCE OF VEHICLE PARAMETERS ON SAFETY IN CRITICAL SITUATIONS

Earlier Volkswagen driving simulator studies showed the relationships among subjective driver judgment, objective parameters and a vehicle parameter TB. The present series of tests was run to determine the effects of the steering ratio and combinations of this parameter TB. The driving task was more difficult than those in earlier studies: the test subject tried to avoid suddenly appearing obstacles. This made it possible

10, 1975

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ts to become involved in critical situations, and s to be drawn from review of the potential acce, as influenced by the vehicle parameter TB ig ratio. Examples are given to illustrate the ef-parameters and load parameters on the vehicle in a variety of different vehicles.

rk AG (Germany), Research and Development
392, INTERNATIONAL AUTOMOBILE TIRE
E PROCEEDINGS, 1974 p91-9
3-741105 ; 1974 ; 5refs
ld in Toronto, Canada, 22-24 Oct 1974.
n HS-016 392

CTOR EXAMINATION OF WET SKID E OF CAR TIRES

programs are described which aim to investigate : of road surface parameters, such as texture &T values (British Pendulum Tester), and of tire n wet skid resistance. The tire parameters consist ors, compound factors, and a carcass stiffness mpirical formulas have been established which in-et skid resistance is dependent on adhesion and c factors. In these two factors, both the influence ace parameters and of tire parameters have been he road surface parameters were studied, particu-ecial test series performed on six different test ominent tire parameters have been established in t program using 18 different common production ther special test, the influence of tread depth of amined. It appears to be feasible to describe this means of a function depending on wear percent-and texture depth of the road surface.

of Tech., Vehicle Research Lab.
6 392, INTERNATIONAL AUTOMOBILE TIRE
NCE PROCEEDINGS, 1974 p100-12
AE-741106 ; 1974 ; 10refs
held in Toronto, Canada, 22-24 Oct 1974.
y the Inst. for Road Safety Res., Netherlands.
: In HS-016 392

EFFECTS OF TIRE-IN-USE FACTORS ON ER CAR PERFORMANCE

ich have been obtained from flat-bed tire tests and : steady-turning vehicle tests show that tire-in-use ve a large influence on the normal driving per- of passenger cars. Test data for bias, belted-bias, tires have been gathered to quantify the effect of in-ssure, tread wear, and shoulder wear on tire shear orrmance. A mobile tire tester has been used to mea-um traction characteristics for worn and under-in- on wet and dry pavements. The importance of the

interaction of steering compliance with tire force and moment properties is examined.

by P. S. Fancher; J. E. Bernard; L. H. Emery
Michigan Univ., Hwy. Safety Res. Inst.; National Hwy.
Traffic Safety Administration
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p113-21
Rept. No. SAE-741107 ; 1974 ; 12refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 406

TIRE PROPERTIES EFFECTS ON PASSENGER CAR HANDLING

A recently completed research program has dealt with the problem of determining the influence of tire construction properties on vehicle braking and handling performance. Several tire properties that affect vehicle dynamic response have been identified and their effects quantitatively determined. Laboratory testing of a large sample of tires has shown that aspect ratio and basic construction type (that is, bias, bias-belted, radial) can significantly affect tire peak braking coefficient and cornering stiffness. The results of computer simulation studies and experimental tests with four automobiles have shown that the effect of changes in the peak braking force coefficient of tires on the average longitudinal deceleration of vehicles with fixed brake proportioning was small. The most marked departures from the handling performance with the original equipment tire configuration occurred when the performance characteristics, primarily cornering stiffness and peak lateral force coefficient, of the tires at the front and rear were different.

by R. D. Roland; R. S. Rice; E. Kakaley
Calspan Corp.; National Hwy. Traffic Safety Administration,
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p122-34
Rept. No. SAE-741108 ; 1974 ; 6refs
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 407

REMARKS BY SPECIAL ASSISTANT TO THE PRESIDENT FOR CONSUMER AFFAIRS.

Uniform tire grading, tire recalls, and industry complaint handling are discussed as three of the many important consumer issues faced by the tire industry. To resolve these and other issues requires a new understanding on the part of the industry of the consumer's needs. To help instill this understanding, both from an industry and from a government perspective, will be the job of the consumer affairs specialists.

by V. H. Knauer
Office of Consumer Affairs, The White House
Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE
CONFERENCE PROCEEDINGS, 1974 p135-8
1974
Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 408

HSL 75-9

HS-016 408

TIRE SERVICING: PRESENT AND FUTURE

Competent tire servicing methods are necessary to realize the capabilities of the quality tires manufactured today. Of approximately 270,000 tire servicing outlets in the U.S., however, few qualify as competent service centers. Competent tire servicing includes proper equipment, proper maintenance for the equipment, related wheel services, emergency and road services, a tire maintenance program, properly trained personnel, and consumer education. To help close the gap between demand and supply in competent tire service, the National Tire Dealers and Retreaders Assoc. has developed a Tire Specialist Program which includes personnel training seminars and clinics, educational programs for the consumer, and a Tire Specialist Guide covering consumer-dealer relations from sales information through technical information and including a broad list of reference material.

by H. W. Noyes

National Tire Dealers and Retreaders Assoc.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p141-3

Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 409

PSYCHOLOGY OF TIRE BUYING AND USE, OR WHAT MOTORISTS DON'T KNOW ABOUT TIRES

Motorists' knowledge about tires is examined, including: if they cause accidents; when to decide to replace and how; proper tire pressure; how far tires should go safely; why one uses which brand; and how to determine which type of tire to buy. This is obtained from motorists' questionnaire answers and questionnaires sent to sellers of tires. Also covered are tires' roles in road service calls and intermix-caused calls. The role of tires in causing accidents is explored, along with what dealers and tire companies do to educate motorists and whether federal tire registration is cost-beneficial. The discussion attempts to cover the motorist's relation to his tires and his knowledge of them, and suggests what should be done to improve this relationship. New information on steel-belted radials is included.

by L. R. Barnes

Michigan AAA

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p144-56
1974

Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 410

THE CONSUMER'S RESPONSIBILITIES IN THE REPLACEMENT-TIRE MARKETPLACE

The relationship between a consumer product, the tire, and the consumer is examined with emphasis on the consumer's responsibilities in the replacement tire marketplace. Two major problems which affect consumers are discussed: marketing policy, and passenger tire performance. The consumer's threefold responsibilities are explored: proper tire selection,

product acceptance, and tire maintenance. A plea is made that the industry attempt, through its advertising, to more thoroughly educate the consumer concerning these responsibilities.

by G. L. Watson

National Hwy. Traffic Safety Administration

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p157-60
1974

Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 411

SUMMATION OF PAPERS

The interrelationship of tire performance characteristics with vehicle requirements and performance is examined. The possibility of variations in tire properties is emphasized, and vehicle tolerance of these variations is considered. The need for accurate evaluation of the tire-vehicle relationship is cited. It is concluded that there is a need for more research in driver psychology, transient responses, and the introduction of one tire into a set.

by R. H. Snyder

Uniroyal Tire Co.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p165-9
1974

Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 412

TIRES, VEHICLE RESPONSE, AND HANDLING

The manner in which tire mechanical properties interact with vehicle design parameters and operating conditions to produce the control responses resulting from driver inputs is discussed. Directional control and braking and their interactions are considered, as well as the effect of changes in these parameters on car-driver performance. It is concluded that cornering stiffness, camber stiffness, aligning torque, load sensitivity, and load transfer sensitivity are the most significant tire properties affecting directional control, while theoretical braking deceleration and braking-steering interaction are primarily dependent on maximum tire brake force coefficient and brake torque distribution. The permissible range of tire characteristics to provide a desired safety level cannot be established without additional data on car-driver performance.

by J. B. Bidwell

General Motors Res. Labs.

Publ: HS-016 392, INTERNATIONAL AUTOMOBILE TIRE CONFERENCE PROCEEDINGS, 1974 p170-6
1974 ; 12refs

Conference held in Toronto, Canada, 22-24 Oct 1974.
Availability: In HS-016 392

HS-016 413

CLOSING REMARKS--SAE/DOT TIRE CONFERENCE

The significance of the various technical papers presented in this conference is emphasized. The papers discussed cover the whole spectrum from road textures to the human driver, with

as on the tire itself. The presentations give only results and views on the relevant problems concerning mechanics, vehicle handling, and human control. Presented should be seen in the light of the existing, which already gives a considerable amount of information. It is noted that continued research, preferably in an orderly coordinated fashion, is needed.

by J. J. J. J. J.
of Tech.
6 392, INTERNATIONAL AUTOMOBILE TIRE
CEC PROCEEDINGS, 1974 p179-83

held in Toronto, Canada, 22-24 Oct 1974.
In HS-016 392

MENT OF AUTOMOBILE FUEL Y

road, engine, chassis dynamometer, and accessory assumption tests was conducted in order to characterize fuel economy of 1973 standard and intermediate size vehicles and systems which appeared to offer fuel benefits were evaluated by means of an analytical study. The study was limited to hardware which could be applied by the 1980 model year. The evaluation was based on urban and steady speed operation, effects of compliance with future emission standards predicted. Combinations of individual improvements were applied to the same vehicle. The evaluation was repeated, and fuel economy improvements of are predicted by comparison with 1973 model year

by J. J. J. J. J.
Res. Inst.
DOT-TSC-628
SAE-740969 ; 1974 ; 18p 6refs
Presented at the Automobile Engineering Meeting, Toronto,
21-25 Oct 1974.
by: SAE

15

CONOMY OF THE 1975 MODELS

model year data on fuel economy are added to the trend and comparisons are made between the 1975 models. Calculation procedures are developed which changes in fuel economy to be determined separately for control systems, new engine-vehicle combinations and mix shifts. Comparisons have been calculated not the fleet as a whole but for each of the 13 manufacturers were certified at the time of writing this paper. The gain in fuel economy for the fleet has been estimated at comparing the 1975 to the 1974 models assuming no mix change occurs. The majority of this change, 11.5%, is attributable to emission control system refinements and optimization. General Motors is responsible for the gain of the fleet average improvement due to the combination of their large market fraction (approximately 40%) and 10% improvement due to engine/control system optimization possible through the use of oxidation catalyst technology. The trend toward improved fuel economy which was initiated by the 1975 models can continue in the future with more stringent emission standards in effect,

provided the achievement of good fuel economy remains a design constraint. Continuation of the trend may require the use of advanced hydrocarbon control systems which have not yet been fully developed.

by T. C. Austin; K. H. Hellman
Environmental Protection Agency
Rept. No. SAE-740970 ; 1974 ; 25p 12refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 416

EUROPEAN TESTING AND CLASSIFICATION FOR PASSENGER CAR FIELD SERVICE OILS

The European passenger car engine lubrication requirements are not the same as the American requirements, the differences being determined by the engine design trends, the nature of fuels used, and the type of service. The European engine and petroleum industries have undertaken the study of engine oil evaluation tests that meet European requirements. On the basis of the present standardized tests, engine manufacturers have recently proposed a specification for crankcase oils. The European tests are discussed with emphasis on repeatability, reproducibility, and correlation with service. Mention is also made of the recent European proposals for revision of the SAE Crankcase Oil Viscosity Classification.

by A. Marcianti
Fiat Central Res. Labs.
Rept. No. SAE-740972 ; 1974 ; 20p 6refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974. Sponsored by the CEC-Engine
Lubricant Technical Com.
Availability: SAE

HS-016 417

HIGH TEMPERATURE LUBRICATION REQUIREMENTS OF EUROPEAN GASOLINE AND DIESEL ENGINES FOR CARS

A CEC Investigation Group has examined temperatures in European gasoline engines. A survey showed top quartile average temperatures of 275°C (top ring groove), 147°C (sump), and 163°C (cam/follower oil gallery and main bearing exit), under high speed driving conditions. Forecasts indicated sump temperatures would increase by 10-15°C, partly related to emissions control systems. Consequent problems were predicted as wear scuffing, oil oxidation, ring sticking, high oil consumption, and bearing/seal distress. Development targets for lubricant high temperature performance tests are discussed, and the severities of a number of possible ring stick tests are compared. A similar CEC Survey concerned high-speed diesel engines. This covered both small passenger car, light van diesels, and larger truck diesels. Increasing ring and oil sump temperatures were identified. High temperature oil performance test needs for the smaller car diesel engine are discussed in the light of problems identified in the survey.

by R. Hollinghurst
Mobil Oil Corp.
Rept. No. SAE-740973 ; 1974 ; 21p 12refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 418

HSL 75-9

HS-016 418

PREDICTION OF VISCOSITY STABILITY OF MULTIGRADE ENGINE OILS IN SERVICE

The viscosity change of multigrade motor oils in service has been evaluated in a fleet representative of the present European car population. The evaluation covered air- and water-cooled engines, with conventional and integral gearboxes, and displacements ranging from 500-1750 cc. The effect of car, service, average ambient temperature, and type of polymer on the viscosity change of a lubricant has been estimated. The multigrade test oils have also been run in injector and bench engine tests in order to compare field testing results with laboratory techniques being developed.

by A. A. C. Ingoni; F. A. Vicenzetto
Snam Progetti S.p.A., Petroleum Products Lab., Italy
Rept. No. SAE-740974 ; 1974 ; 13p 5refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 419

EUROPEAN LOW TEMPERATURE VISCOSITY REQUIREMENTS FOR ENGINE OILS, AND THEIR IMPACT ON SAE CLASSIFICATION UTILIZATION

CEC investigation group IGL-8 has conducted a survey of European engine cold starting and oil viscosity requirements. The group's objectives were to determine if the 20W bracket was too wide for European use and what alternatives existed for improving the matching of oil quality to manufacturer needs. A study of engine cranking speeds showed that the span of the 20W range is twice that of the 10W range for European cars. Car Cold Startability, and the weather data analysis, also showed that the span covered by the 20W range was double that for the 10W range, and that a critical winter temperature for many more temperate countries was minus 10°C (14°F). For many cars, an oil in the 48-64 poise range at minus 18°C (0°F) would provide 95-97% confidence of starting in the coldest month, January, and would best match their needs. Some diesel starting data, particularly on small, high-speed engines appeared to show the same trends. Due to concern over high temperature operational problems, a number of European car manufacturers prefer mid-range 20W oils at the 45-64 poise level to 10W oils. Recognizing this, the CEC has suggested that the SAE may want to consider establishment of an intermediate 15W grade with 48 poise maximum at minus 18°C (0°F). A minority also suggested reduction of the 20W upper limit at 64 poise, but this received only limited support because of worldwide impact on existing satisfied users of high 20W oils.

by R. Hollinghurst; C. G. Nystrom
Mobil Oil Co., England; Nynas (A.B.) Petroleum, Sweden
Rept. No. SAE-740975 ; 1974 ; 10p 5refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 420

TEMPORARY VISCOSITY LOSS OF ENGINE OILS

The temporary viscosity loss under high shear rates of engine lubricants was examined to: set up a new viscometer, more

correlated with the engine than the present ones; and clarify the influence of this phenomenon on the lubricant performances. Preliminary results on a pressoviscometer are discussed. Namely it is underlined that the temporary viscosity loss affects both multigrade and unigrade oils, even if at different levels, and in different ways.

by G. F. Busetto; U. Giulio; E. Volpi
Fiat, Central Res. Labs.
Rept. No. SAE-740976 ; 1974 ; 17p 21refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 421

JOINING OF P/M STRUCTURES

A comparison of standard methods of joining P/M structures, as well as new techniques, is presented. The porosity of a P/M part is no longer a problem when joining P/M to P/M or P/M to wrought. These joints will be as strong or stronger than the P/M material. The systems give the design engineer more flexibility.

by W. V. Knopp
Johnson (A.) and Co., Inc.
Rept. No. SAE-740984 ; 1974 ; 6p
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 422

DYNAMIC CHARACTERISTICS OF AN ELASTOMERIC-PNEUMATIC ISOLATOR WITH ORIFICE-TYPE RELAXATION DAMPING FOR VEHICULAR SUSPENSION APPLICATIONS

The theoretical dynamic properties of an elastomeric-pneumatic isolator with orifice-type relaxation damping are presented. The design concept results in a low profile, low natural frequency, and very stable isolator for shock and vibration isolation. The objective of the isolator design is to provide the maximum degree of vibration and shock attenuation of typical vehicle excitations to the vehicle operator at the frequencies where the human body is most sensitive to dynamic excitations. The effectiveness of the system was evaluated by determining the improvement in operator comfort through the utilization of the response characteristics of simple mechanical oscillators attached to the isolated and unisolated excitation surfaces. The results show that the relaxation-damped elastomeric-pneumatic isolator concept provides large comfort effectiveness values for vehicle operators during typical vehicle operating conditions.

by D. W. Schubert; R. H. Racca
Wright (Barry) Corp., Barry Div.
Rept. No. SAE-740991 ; 1974 ; 17p 8refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 423

VEHICLE FIELD DATA COLLECTION

Methods are discussed for obtaining in-service loads, motions, and operational parameters on customer-operated vehicles. Special load measuring transducers and unique unattended monitor recorders were utilized. Some statistics associated with selection of field customers are discussed.

by J. R. Peterson
General Motors Proving Ground
Rept. No. SAE-740941 ; 1974 ; 8p
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 424

DEVELOPMENT OF POLYMERIC MATERIALS FOR HUMANLIKE NECK SIMULATIONS

Several polymeric materials were developed and evaluated for possible inclusion in the neck structure of state-of-the-art anthropomorphic dummies. These included three types of foam-polyvinylchloride, polyethylene, and polyurethane, and two flexible polymers--polyurethane and a polyvinylchloride chlorinated polyethylene blend (PVC-CPE). Two materials, the polyurethane elastomer and the PVC-CPE blend, were found to be satisfactory in their dynamic response. Because of the ease of casting, the polyurethane material will be used in the GMR 1 state of the art dummy.

by G. A. Campbell; E. M. Hagerman; S. A. Lobst; W. C. Meluch; R. J. Salloun; C. C. Culver
General Motors Corp., Res. Labs.
Rept. No. SAE-740993 ; 1974 ; 7p 4refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 425

FORD IGNITION INTERLOCK DESIGN CONSIDERATIONS

A seat belt interlock design is described which includes several operator convenience features: RESTART mode, seat bounce filtering, and voltage transient protection circuitry. A two pin oscillator implemented with CMOS technology is also described.

by D. M. Rukavina; R. A. Wilke
Lake Center Industries, Inc.
Rept. No. SAE-741099 ; 1974 ; 8p
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 426

LOCATING IC ENGINE HOT-SPOTS USING A MAGNESIUM BORATE SOLUTION

An experimental technique for locating engine cooling system hot spots by using a magnesium borate water solution for the engine coolant is presented. Magnesium borate is deposited wherever local boiling occurs, indicating the high temperature

areas. This technique was applied to a large V-8 engine and provided visual results of high temperature areas in the water jacket. Color photographs show the results, which correlate with measured metal temperatures and measured coolant flow velocities. The extension of the technique to include estimation of metal temperatures results from additional test data reported. The procedure is useful for locating unsuspected hot spots in any passage in the engine cooling system. The severity of the temperature may be determined by knowing the boiling point of the solution.

by L. E. Woods; D. M. Kabat
Ford Motor Co., Engine Div.
Rept. No. SAE-741016 ; 1974 ; 18p 7refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 427

TEMPERATURE HISTORY IN THE COMBUSTION CHAMBER OF A SPARK IGNITION ENGINE

The temperature history at a location in the combustion chamber of a spark ignition engine is determined by using the intensity of radiation from the recombination continuum: carbon monoxide 0 oxygen resulting in carbon dioxide 0 hv. The flame was initiated separately at two locations in the combustion chamber while the radiation was monitored at one location thereby making the arrangement somewhat equivalent to monitoring the radiation from two different gas zones in the chamber. Agreement between the predicted temperature history with heat transfer and the experimental temperature measurements was found to be good around the stoichiometric region but large differences were noticed when the engine was run at lean mixture strengths.

by K. S. Varde; G. G. Lucas
Colgate Univ.; University of Technology, England
Contract SRC-B/RG/031
Rept. No. SAE-741017 ; 1974 ; 13p 22refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct. 1974.
Availability: SAE

HS-016 428

COMPUTER ANALYSIS OF BEARINGS IN ROTARY ENGINES

A suite of computer programs has been developed for the analysis of loading and lubrication characteristics of rotor bearings and main bearings in the rotary engine. The lubrication analysis was very similar to that for reciprocating engines and required only very slight modification.

by P. M. Edwards
Vandervell Products Ltd., England
Rept. No. SAE-741018 ; 1974 ; 12p 3refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 429

HS-016 429

WATER PUMP BEARING LIFE PREDICTION IN AUTOMOTIVE ENGINE APPLICATION

The engineering analysis for an improved method of water pump bearing service load and life prediction is described. This general analysis considers most of the design variations which are found among engines, water pumps, and bearings in current use. An accounting is made of the various sources of bearing loading occurring in this application. Bearing life is determined according to the recently revised A.F.B.M.A. standards.

by J. P. McDonald
Ford Motor Co.
Rept. No. SAE-741019 ; 1974 ; 30p 15refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 430

AIRFLOW BENEATH AN AUTOMOBILE

A study of the airflow beneath an automobile relied on road tests of two vehicles to reduce simulation errors caused by the moving road boundary. Testing verified the possibility of a very low Reynolds number boundary layer existing on the road beneath the vehicle. Flow separation associated with this boundary layer could have significant influence on the lift and pitching moments of the vehicle.

by B. S. Buckley; E. V. Laitone
Massachusetts Inst. of Tech., Dept. of Mechanical
Engineering; University of California Berkeley, Dept. of
Mechanical Engineering
Rept. No. SAE-741028 ; 1974 ; 8p 12refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974. Prepared in cooperation with Group
Lotus Car Co., Ltd. and Sports Car Club of America.
Availability: SAE

HS-016 431

MOTOR ACCIDENTS IN NEW ZEALAND. STATISTICAL STATEMENT

Statistics are presented which illustrate the pattern of road accidents involving death or injury which occurred during 1973. The data are divided into: statistics on historical trends; general statistics for the year; accidents by cities, boroughs, towns, and counties; and pedestrian, motorcycle and powercycle, and bicycle collisions.

Ministry of Transport, Statistics Sec., Economics Div., Private
Bag, Wellington, New Zealand
1973 ; 70p
Availability: Corporate author

HS-016 432

TEMPERATURE MEASUREMENTS ON VEHICLE TYRES [TIRES] (TEMPERATURMESSUNGEN AM FAHRZEUGLUFTREIFEN)

Examination of tire development shows the importance of problems in the control of thermal stress. Although tempera-

HSL

tures differ greatly over the tire cross-section, simply measurements of temperature at the external surface suffice for the evaluation of certain trends. No matter how a product the tire manufacturer provides, it is vital the vehicle owner should always ensure that his tires conform with the recommended operating conditions.

by P. Zeranski; R. J. H. Milne, tr.
Motor Industry Res. Assoc., Watling St., Nuneaton, War
England
Publ: KRAFTFAHRZEUGTECHNIK n10 p297-300 (Oct
Rept. No. Trans-12/74 ; 1974 ; 13p 32refs
Translated from German.
Availability: Corporate author

HS-016 433

LOCKED-WHEEL PAVEMENT SKID TESTER CORRELATION AND CALIBRATION TECHNIQUE

Reasons for poor correlation among locked-wheel pavement skid testers are examined, and measures for improving correlation are proposed. Investigative, experimental, analytical verification approaches were used to meet the objectives. Skid testers, one a two-wheel and the other a single-wheel design, were used in an extensive field test program to determine effects of specific variables on skid-resistance measurement. Primary attention was given to the effects of pavement wetting and trailer dynamics. Temperature effects were studied both in the field and on an indoor circular track apparatus. Repeatability was studied to separate the effect of random errors from those of systematic errors in testing. Magnitude of each error source was determined. A skid test dynamics model was developed and programmed on a hybrid computer, and design and operational parameters were varied over a wide range to study their effects on skid test results. Programming pavement profiles from perfectly smooth to actual, rough-road profiles while maintaining a constant coefficient of friction allowed the study of dynamic effects on performance independent of friction effects. A correlation program involving 12 skid testers was held, to evaluate benefits obtained in practice from application of the recommended corrective measures. Results of the correlation program indicated that the factors most responsible for the typically poor correlation in order of decreasing effect were: calibration and wheel load, chart interpretation, evaluation, watering systems, and temperature differences. Test data were analyzed by statistical methods, and the factors controlling the accuracy of skid resistance measurement were identified. Recommendations are made for improving skid-testing equipment and the calibration, operation, data evaluation procedures. It is generally recommended that ASTM E 274 be changed to incorporate the corrective measures formulated in this project for improving skid tester performance. A standardized design of a skid tester for inventory testing is recommended as a means to simplify the correlation problem and allow uniform calibration and operation procedures to be employed.

by W. E. Meyer; R. R. Hegmon; T. D. Gillespie
Pennsylvania State Univ., University Park, Pa.
Rept. No. NCHRP-151 ; 1974 ; 110p 54refs
Sponsored by the American Assoc. of State Hwy. and
Transportation Officials in cooperation with the Federal Highway Administration.
Availability: Corporate author \$6.00

September 30, 1975

HS-016 438

HS-016 434

CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY TROY, MICHIGAN, OCTOBER 28 THRU 30, 1974. CONFERENCE PROCEEDINGS

Conference papers are presented which deal with various aspects of automotive electronic technology. Specific topics covered include: connector requirements and technology; electronic fuel management; solid state memories and microprocessors; reliability assessment; MOS/LSI circuit technology; multi-national semiconductor and automotive electronics; fuel management and emission systems; electronic fuel injection; automotive electronics in Japan; transducers; and the importance of total systems thinking.

Institute of Electrical and Electronics Engineers, Inc.; Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, Pa. 15096
Rept. No. IEEE-Cat-74CH0928-2VT; SAE-SP-57; 1975; 172p refs
Includes HS-016 435--HS-016 449
Availability: SAE

HS-016 435

CONNECTOR REQUIREMENTS AND TECHNOLOGY

The basic physics of electric contacts is reviewed with the objective of demonstrating how an understanding of the fundamental phenomena governing the behavior of electric contacts can be useful not only to designers and manufacturers, but also to users of electrical connectors. Items covered include: the origin and significance of contact resistance; influence of material properties on contact performance; selection of platings or other protective coatings for connector contacts; current-carrying capacity of contacts; and the effects of film and contaminants in contacts. The correlation of theory and experiment is illustrated with graphs of typical laboratory experimental data. Relative to the usage of electrical connectors in automotive electronics, it is shown that much of the technology which exists and was developed in and for other industries will be applicable in the automotive industry. New specific, and unique problems relating to connector requirements and application will be encountered in automotive electronics, and the best chance of solving them is to acquire an appreciation of basic connector fundamentals.

by J. H. Whitley
AMP, Inc.

Publ: HS-016 434, CONVERGENCE 74, INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p1-7
1975

Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 436

ELECTRONIC FUEL MANAGEMENT--PRACTICAL OR PRESUMPTUOUS?

The question of whether electronics is practical or presumptuous is examined from an economic or businessman's viewpoint rather than from the purely technical one. Emphasis is on the fuel management system, which must meet stringent

demands. Advantages and disadvantages are outlined, and it is shown that the only way the divergent requirements can be reconciled is through extremely accurate control. Electronics is shown to be the only available method that can provide that high degree of accuracy in sensing, computation and control. Various types of power plants are discussed briefly.

by W. L. Miron
Bendix Corp.

Publ: HS-016 434, CONVERGENCE 74, INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p9-13
1975

Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 437

THE STATE OF THE ART OF SOLID STATE MEMORIES AND MICROPROCESSORS

Improvements in cost or performance of an order of magnitude are occurring in the technology available to make small computers. This is occurring both in the processing unit with the microprocessor, and in the memories supporting the processor. As cost/performance is improved, the computer can be dedicated to more mundane tasks, such as carburetor control, while already being used in traffic light control. This development, permitting the use of arbitrarily large amounts of intelligence at low cost, makes electronics capable of performing control functions formerly done with mechanical or hydraulic systems.

by R. N. Noyce; W. H. Davidow
Intel Corp.

Publ: HS-016 434, CONVERGENCE 74, INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p15-8
1975

Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 438

A RELIABILITY ASSESSMENT OF AUTOMOTIVE ELECTRONICS

Electronic reliability, as related to the automotive system, is discussed in four parts: the dual requirements of high reliability and of low unit price imposed on the semiconductor industry by the automotive system; how semiconductor device reliability has been and is being raised to levels of reliability commensurate with the needs of the automotive system; some suggestions as to how the semiconductor industry and the automobile industry might work together most effectively; and the overall situation as the semiconductor industry see it. Reliability data are shown for discrete devices (transistors, power devices) and for integrated circuits. Field performance data are given for two specific applications: the skid control module and the seat belt interlock module. The triple characteristics of semiconductor failures with time are: early failures, random failures, and wearout failures. Good communication is imperative if the semiconductor industry is to translate quantitatively and correctly the reliability needs of the automotive system

into those semiconductor screening tests used to achieve definite levels of device reliability.

by C. G. Peattie
Texas Instruments, Inc.
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p19-22
1975
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 439

MOS WITHOUT TEARS, OR HOW TO GET THE MOST FROM YOUR MOS/LSI INVESTMENT

The application of MOS/LSI circuit technology to the automotive industry is described as a custom subsystem for the automobile. Beneficial features are outlined. It is shown to offer the highest density of functions at the lowest per-function cost whenever there is sufficient volume to justify the expense of development and tooling. Standard and custom circuits are differentiated, and the batch process itself is described. Key features to look for when selecting a MOS vendor are listed.

by B. T. Marren
American Microsystems, Inc.
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p23-32
1975
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 440

THE CHALLENGE OF AUTOMOTIVE ELECTRONICS IN THE U.S.A.

The growth of electronics from the vacuum tube to the transistor and finally large scale integrated circuits, and the impact of this growth on automotive electronics is discussed. Brief descriptions of current automotive electronic subsystems are presented. Several experimental automotive integrated electronic systems, including diagnostic systems and display systems, which have been developed and tested are covered. A simple digital system containing inputs from transducers and driver commands, outputs to displays and actuators, and a central processor is used to describe the problems associated with installing an integrated electronic control system on an automobile. The problems associated with automatic radar braking are enumerated.

by T. O. Jones
General Motors Corp.
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p33-75
1975 ; 82refs
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 441

THE MULTI-NATIONAL SEMICONDUCTOR AND AUTOMOTIVE ELECTRONICS

Unfulfilled promises and rare instances of success in the semiconductor field for automotive electronics are discussed from the viewpoint of a semiconductor manufacturer. Differences in organizations and operational philosophies in the two industries are noted. It is suggested that the interface problems may be solved by the growing public concern and involvement with air pollution and highway safety, as well as the continued development of the multinational corporation.

by J. R. Welty
Motorola Semiconductor Products Div.
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p77-9
1975
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 442

APPLICATION OF ELECTRONICS TO FUEL MANAGEMENT AND EMISSION SYSTEMS: ELECTRONIC FUEL INJECTION IN EUROPE

The recent development effort concentrated on further improvement of emission control and fuel economy is discussed. The Bosch electronic fuel injection was advanced from using absolute intake manifold pressure as the main input variable to an air metering system. This approach simplifies emission control combined with less cost gained by other improvements. Better fuel economy in combination with low emissions is achieved by closed-loop control employing the lambda sensor. The structure of this control loop allows the application of a self-adaptive control system responding to changing operating conditions of the engine. A further possibility is the closed-loop control at air-fuel ratios slightly richer or leaner than stoichiometric. This application widens the use of the lambda sensor to different emission control packages dependent on applicable standards.

by H. Eisele
Bosch (Robert) GMBH
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p81-8
1975 ; 4refs
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 443

ELECTRONIC FUEL INJECTION IN THE U.S.A.

A brief evolutionary history is followed by a technical description of the current Bendix electronic fuel injection (EFI) system concepts. Application requirements are reviewed in relation to vehicle emissions, fuel economy and driveability. The advantages of feedback control are discussed with emphasis on the need for low-cost durable sensors. EFI is compared to the carburetor and other competitive systems in terms of cost, fuel control accuracy, and fuel economy. The current

er 30, 1975

HS-016 448

3FI electronic circuit technology and a projection of
eration designs are reviewed. System manufacturing
ions, including costs, are covered. The necessary ap-
developments are reviewed, including the future
of integrated electronic controls.

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016 434, CONVERGENCE 74. INTERNATIONAL
UIUM ON AUTOMOTIVE ELECTRONIC
OLOGY CONFERENCE PROCEEDINGS,
le, Pa., 1975 p89-104
fs
ce held in Troy, Mich., 28-30 Oct 1974.
ty: In HS-016 434

44

ATUS OF AUTOMOTIVE ELECTRONICS IN

lopment and production of automotive electronics in
e discussed in terms of: automotive electronic system;
ve electronics for test purposes; electric cars; traffic
ystem; activity of SAE; and general status of the in-
t is presumed that the marriage of the automobile and
ronics industries will be made in the near future, but
s are anticipated.

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lenso Co. Ltd.
S-016 434, CONVERGENCE 74. INTERNATIONAL
QUIUM ON AUTOMOTIVE ELECTRONIC
OLOGY CONFERENCE PROCEEDINGS,
iale, Pa., 1975 p105-23

nce held in Troy, Mich., 28-30 Oct 1974.
ility: In HS-016 434

445

S EASIER GETTING TO THE MOON

ns inherent in the development of automotive electronic
s are discussed and the difficulties involved are
sized. A comparison is made to the lunar landing effort,
s noted that in that case the landing was a national goal
commitment of national resources and supported by the
. That advantage does not exist in the automotive and
nics industries. Goals are reviewed, such as the applica-
f electronics technology to automobiles, trucks, and
in a planned, rational cost-effective manner that will
e both economic and performance benefits to the buyer
ake important contributions to improved safety, im-
l energy utilization, and reductions in environmental pol-

L. Williams
vell International
HS-016 434, CONVERGENCE 74. INTERNATIONAL
OQUIUM ON AUTOMOTIVE ELECTRONIC
NOLOGY CONFERENCE PROCEEDINGS,
ndale, Pa., 1975 p125-8

rence held in Troy, Mich., 28-30 Oct 1974.
ability: In HS-016 434

HS-016 446

THE STATE OF THE ART OF TRANSDUCERS

The direction of further development and future usefulness of
various types of transducers are examined from the European
viewpoint. The need for high accuracy, low cost transducers is
noted, and the wide range of transducers both being used and
under consideration for development is described. It is con-
cluded that position transducers offer the best examples of
direct digital transducers currently available, in which use is
frequently made of simple mechanical contacts or opto-elec-
tronic components.

by E. McEwen
Joseph Lucas Ltd., England
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL
COLLOQUIUM ON AUTOMOTIVE ELECTRONIC
TECHNOLOGY CONFERENCE PROCEEDINGS,
Warrendale, Pa., 1975 p129-35
1975 ; 5refs
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 447

A LONG-RANGE LOOK AT SEMICONDUCTOR DEVELOPMENT AND ITS IMPACT ON AUTOMOTIVE ELECTRONICS

To ensure cost-effectiveness, automotive industry solid-state
device requirements, a small percentage of total U.S. con-
sumption, will be met through custom designs using technolo-
gies applicable to non-automotive applications as well. N-MOS
and complementary-MOS technologies with their cost and per-
formance advantages and smaller size will prevail in digital
signal processing; bipolar integrated circuits (IC's) plus IC's
combining bipolar and MOS technologies on the same chip will
be used for linear signal processing. Multiple-epitaxial struc-
tured silicon power devices will be used as actuator drivers.
The reliability/cost equation will be solved by using buffered
power sources to permit use of custom-designed low-voltage
IC signal-processing circuits. Power devices having device
characteristics that can withstand the high voltage transients
will provide the interface between the low level signal
processing and actuator drivers. As the number of applications
increases, both power devices and IC's will be packaged in
plastic packages as operating environments permit and basic
die-construction improvements are effected.

by B. V. Vonderschmitt
RCA Solid State
Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL
COLLOQUIUM ON AUTOMOTIVE ELECTRONIC
TECHNOLOGY CONFERENCE PROCEEDINGS,
Warrendale, Pa., 1975 p137-47
1975
Conference held in Troy, Mich., 28-30 Oct 1974.
Availability: In HS-016 434

HS-016 448

THE STATUS OF AUTOMOTIVE ELECTRONICS IN EUROPE

A historical background of European automotive electronics is
offered, followed by an analysis of the value of the electronic
equipment which may be installed on automobile vehicles in

the near future. Factors influencing future development are discussed, including market requirements, cost, experience, and the peculiarity of automotive application requirements. Technological criteria are also considered, such as standard discrete components, thick and thin film technique, standard integrated circuits, large and medium scale integration, micro-computers and programmable logics, transducers and actuators, voltage stabilization for electronic ignition, and adaptive systems for antiskid.

by G. F. Villa

Fiat S. p. A.

Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p149-59

1975

Conference held in Troy, Mich., 28-30 Oct 1974.

Availability: In HS-016 434

HS-016 449

THE IMPORTANCE OF TOTAL SYSTEMS THINKING IN ORDER TO BRING AUTOMOTIVE ELECTRONICS TO A PRODUCTION STATE

Electronics is shown to be a positive and reliable means of sensing pressure, temperature, switch status and rotational speed of various components in the automotive systems, and to perform logic and compare signals on the sense parameters in order to better control the total automotive system. Electronics is able to replace mechanical springs, levels, stepping motors, and gears; it performs logic functions in a very positive and reliable way and can solve the problems inexpensively. Cooperation between the electronics and automotive industries will make this possible.

by E. F. Kvamme

National Semiconductor Corp.

Publ: HS-016 434, CONVERGENCE 74. INTERNATIONAL COLLOQUIUM ON AUTOMOTIVE ELECTRONIC TECHNOLOGY CONFERENCE PROCEEDINGS, Warrendale, Pa., 1975 p161-8

1975

Conference held in Troy, Mich., 28-30 Oct 1974.

Availability: In HS-016 434

HS-016 450

UNIFORMITY-PRUFUNG VON REIFEN (TESTING OF TYRE UNIFORMITY)

A tire testing machine is described which can check force dependent uniformity in continuous running. The causes and results of defects are noted. The characteristic feature of the testing machine is a digital computer, which takes charge of the data processing and a part of the control. Definite advantages over analog performing machines are shown: short cycle time, high accuracy, and statistical evaluation of the measured values. The statistical values are determined progressively, so that at any time, details of the quality level can be given to the process control.

by W. Grins

Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77 n2 p46-9 (Feb 1975)

1975

Text in German. English summary.

Availability: See publication

HS-016 451

BESTIMMUNG DER GLEICHGEWICHTSLAGE DER RADAUFHANGUNG BEI STATIONAREN BREMS- UND ANTRIEBSKRAFTEN (DETERMINATION OF THE POSITION OF EQUILIBRIUM OF WHEEL SUSPENSIONS UNDER CONSTANT ACCELERATION AND DECELERATION FORCES)

The dynamic forces during braking and accelerating which cause movements in the suspension of front and rear wheels are described. Generally, the spring characteristic is non-linear and the angle varies with wheel travel, and the relation between front and rear wheel braking forces is frequently not constant for all deceleration values. The method of determining wheel travel under constant deceleration or acceleration forces is shown in connection with a rear wheel suspension. With each change of wheel position, there is associated a change of spring load and a certain angle which indicates the direction of the suspension reaction force N at the wheel contact point. The reaction force N is directly transmitted to the chassis without influencing the spring suspension. Line diagrams are drawn with associated spring force differences and angles, the lines being numbered in accordance with the corresponding values of wheel travel. The dynamic force resulting from the wheel load displacement and the braking is plotted so that wheel travel can be read.

by W. Matschinsky

Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77 n2 p53-7 (Feb 1975)

1975 ; 5refs

Text in German. English summary.

Availability: See publication

HS-016 452

SCHEIBENRADER FUR SCHLAUCHLOSE NUTZFahrzeugreifen (DISC WHEELS FOR TUBELESS TYRES OF COMMERCIAL VEHICLES)

Fatigue life of wheels with 15°-DC-rims is determined by the number of cycles to hairline cracks, due to the fissures starting from the critical system point of welding through the rim causing leakage of the tire. Lifetime of wheels with 5°-advanced rims is decided by the number of cycles up to fracture. The ratio of cycles from hairline cracks to fracture is 1:2 to 1:3. Local stress has to be lower on wheels with 15°-DC-rims, which means a well-balanced relation between stiffness of disc and rim for an optimum wheel construction. The most favorable solution for the future has been found in 15°-DC-wheel by systematic development and investigation. Both test stand and vehicle tests, as well as road usage have shown that only 100% of the decisive characteristics (i.e., stiffness of the rim by large rounded flanges; welding position rim/disc under the cylindrical ledge in the stress-zero-passage) guarantee optimum lifetime. An additional favorable effect is attained by realization of a gutter for stiffness near the radius of the disc frame.

by H. Brinkmann

Publ: ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77 n2 p35-9 (Feb 1975)

1975 ; 5refs

Text in German. English summary.

Availability: See publication

ber 30, 1975

HS-016 459

453

KRAFT-FREQUENZGANGE VON REIFEN (FREQUENCY RESPONSE OF TYRES)

icy response of tires is examined in view of findings
ady state and transient tire properties are quite dif-
from each other. On a Porsche tire testing rig, rolling
were electrohydraulically swivelled around their verti-
al. Frequency responses, ascertained by means of this
al slip angle input, are explained. The relevant ten-
could be illustrated on logarithmically divided
ency and speed ordinates. The lateral force amplitudes
e and the phase angles increase as a function of the in-
of frequency or the decrease of speed. With high
the dynamic lateral force amplitudes are bigger than
responding steady state values. When relating both
to each other, the amplitude response becomes suffi-
independent from the slip angle amplitude. Examina-
of the influence of distance frequency revealed that it
erve to unify the formation of the phase angle but that it
ot affect the amplitude response.

Weber; H.-G. Persch
ATZ AUTOMOBILTECHNISCHE ZEITSCHRIFT v77
1-6 (Feb 1975)
35refs
n German. English summary.
bility: See publication

6 454

CH 55: THE NATIONAL SPEED LIMIT

possibility is discussed that the national 55-mph speed
may actually be preventing intelligent use of finite fuel
ves. Reasons for the initial enforcement of the speed limit
eviewed. It is shown that the 14.8% savings in gasoline
ting from the speed limit must be factored by 45% for an
d savings of 6.7%, which must be factored again by the
ge driven in those states that had speed limits lower than
ph before the Federal law was passed. The relationship
een fuel economy and total vehicle weight is emphasized
illustrated. Reduced weight results in fuel savings. A tax
ula is proposed to encourage production and sales of
er weight vehicles.

I. L. Adams
MOTOR TREND v27 n4 p33-6 (Apr 1975)
bility: See publication

016 455

THEMATICAL MODELLING, SIMULATION AND PERIMENTAL TESTING OF BIOMECHANICAL STEM CRASH RESPONSE

review of mathematical models simulating biodynamic
ponse to impact acceleration is given along with the as-
siated experimental validation studies that have been per-
med. The types of models surveyed include gross motion
ulators, head injury models, and spinal and thoracic

models. Sufficient details are provided to indicate to potential
users their applicability and relative cost.

by A. I. King; C. C. Chou
Contract ONR-N00014-69-A-0235-0003
Publ: MVMA INFORMATION RESEARCH BULLETIN
n553-763 p1-18 (Mar 1975)
1975 ; 102refs
Presented at the American Inst. and Astronauts Meeting,
Washington, D. C. 28 Feb 1975.
Availability: See publication

HS-016 456

STRETCHING THE GASOLINE GALLON. AN ENGINEERING APPROACH

Methods for reducing energy demand per vehicle-mile are
discussed in terms of engine improvements and alternatives,
weight, size, safety factors, and other design features. It is
concluded that changes and improvements must be made in
these areas to meet the growing demand for transportation ser-
vices and at the same time achieve efficiency in the use of
energy. If all the available technology is applied to existing
passenger vehicles, the savings could be as great as 30% of the
estimated 1985 projected fuel use. This would substantially ex-
tend the supply of fossil fuels.

by S. E. Blake
Publ: TRANSPORTATION RESEARCH NEWS n57 p11-5
(Winter 1974)
1974
Availability: See publication

HS-016 457

ALCOHOL POWER. CAN IT HELP YOU MEET THE SOARING COST OF GASOLINE?

Methanol is discussed as the only real alternate fuel that can
be poured into the gas tank. Performance tests with the fuel
are discussed, and it is shown that methanol is easier to store,
pour, pipe, and pump than hydrogen, natural gas, ammonia, or
other proposed alternate fuels. Methods of producing methanol
from municipal waste are considered, and changeover
problems are examined. Difficulties in mixing at below freez-
ing temperatures are also discussed. It is concluded that
methanol for gas turbine fuel, boilers, and heating is practical.
A national effort to phase in methanol now is advocated.

by E. F. Lindsley
Publ: POPULAR SCIENCE v206 n4 p68-72 (Apr 1975)
1975 ; 1ref
Availability: See publication

HS-016 459

EFFLUX OF GASEOUS HYDROGEN OR METHANE FUELS FROM THE INTERIOR OF AN AUTOMOBILE. FINAL REPORT

Gasoline-powered automobiles are being converted to operate
on gaseous fuels such as hydrogen or methane. These fuels are
commonly stored in containers located in the trunk of the car.
Potential leakage into the passenger compartment constitutes a
safety threat. Definitive experiments were performed to identi-
fy the explosion hazards, establish venting criteria and obviate

HS-016 460

general safeguards for hydrogen- or methane-fueled passenger vehicles. Appropriately designed ventilation systems significantly reduce the safety hazards associated with accumulated combustible gases. Vents are recommended for all automobiles converted to burn hydrogen and methane and may possibly be eliminated in new cars that are designed for gaseous fuel operation. Combustible gas warning systems are recommended, at least in the interim, for all (converted and new-design) gaseous fueled vehicles. Hydrogen and methane gases appear equally safe as vehicular fuels if used in properly designed vehicles.

by J. M. Arvidson; J. Hord; D. B. Mann
National Bureau of Standards, Inst. for Basic Standards,
Cryogenics Div., Boulder, Colo. 80302
Rept. No. NBS-TN-666 ; 1975 ; 58p 19refs
Sponsored in part by the General Services Administration.
Availability: GPO \$1.10

HS-016 460

**MOTOR CARRIER ACCIDENT INVESTIGATION.
TRIANGLE PACIFIC CABINETS, INC. ACCIDENT--
FEBRUARY 22, 1972--HUBBARD, OHIO**

An accident involving a tractor-semitrailer combination which ran off the road and collided with a bridge support is described. The truck gradually ran off the left side of the road, crashed through a guardrail and plunged down an embankment to the bridge support, resulting in driver fatality and \$25,500.00 property damage. The cause of the accident is identified as the driver's coronary insufficiency and/or cardiovascular disease and loss of vehicle control. The accident illustrates the necessity for physicians to weigh heavily the strenuous nature of the truckdriving profession and the past medical history of the truckdriver when judging physical qualifications and issuing medical certificates pursuant to the Federal Motor Carrier Safety Regulations.

Bureau of Motor Carrier Safety, Washington, D. C.
Rept. No. BMCS-72-6 ; 1972 ; 12p
Availability: Corporate author

HS-016 461

**KLEUR EN PREVENTIE (COLOUR AND
PREVENTION)**

Accident risk depends upon the divergence between the perceived risk and the actual risk. The level of the risk perceived depends among other things upon the manner in which the road users react to the stimulus of the road environment. In order to bring the perceived risk as near as possible to the objective risk, these stimuli must be transmitted to the road users at the right moment in a situation of movement; they must be perceptible and comprehensible to a large extent. Color can play an important part. It is a fact that affective reactions are quicker than intelligent reactions. It has been proven that certain colors increase the visibility of objects being part of the road environment and allow for a quicker and more efficient reaction. This study examines the possible influence of a well-advised choice of colors for road signals, road markings, vehicles, and pedestrian clothing. It is concluded that a well-advised choice can ease the task of the

HSL 75-9

drivers and that it can consequently contribute to greater road safety.

by R. J. Pote
Publ: CIDITVA (TECHNICAL ASPECTS OF ROAD
SAFETY) v58 n6 p2.1-2.14 (1974)
1974 ; 25refs
Text in Dutch. English summary.
Availability: See publication

HS-016 462

**ANALYSE VON PKW- UND LKW-
INNENGERAEUSCHEN UND
SCHLUSSFOLGERUNGEN FUER INTERNATIONALE
GRENZWERTE (ANALYSIS OF INTERIOR NOISE OF
PRIVATE VEHICLES AND LORRIES AND
CONCLUSIONS IN VIEW OF THE INTERNATIONAL
LIMIT VALUES)**

Following an analysis of interior noise in 208 different types of private vehicles and 49 types of trucks, it is proposed that from 1980 and 1990 on, interior noise limits should be maintained at 80 dB(A) and 75 dB(A), respectively. Tables are appended which give other data concerning the optimal values and the evolution of noise production.

by G. Engler
Publ: CIDITVA (TECHNICAL ASPECTS OF ROAD
SAFETY) v58 n6 p4.1-4.16 (1974)
1974
Text in German. English summary.
Availability: See publication

HS-016 463

**SHOCK ABSORPTION TEST METHODS FOR
PROTECTIVE HELMETS**

The shock absorption properties of protective helmets for road users are currently tested by one of three methods: the rigid headform, the swingaway headform, and the falling headform models. The rigid headform method is limited in scope as regards possible impact sites for modern road helmets which afford head protection well beyond the extent of their forerunners. The swingaway headform and the falling headform methods both overcome this limitation. The falling headform method is operated in terms of the headform accelerations developed for specific impact velocities, instead of the parameters of developed force and impact energy which are customary for the testing of materials.

by V. J. Jehu
Publ: CIDITVA (TECHNICAL ASPECTS OF ROAD
SAFETY) v58 n6 p3.1-3.9 (1974)
1974 ; 1ref
Sponsored by the Transport and Road Res. Lab., England.
Availability: See publication

HS-016 464

**THE PREDICTION OF ACCIDENT LIABILITY
THROUGH BIOGRAPHICAL DATA AND
PSYCHOMETRIC TESTS**

Highly contrasted samples of drivers having three or more accidents (30) and drivers having no accidents (accident-free)

were studied in detail to determine factors related to accident involvement. Information was collected concerning biographical and driving-related data, personality traits and attitudes, parental relationships, perceptual style, perceptual motor coordination, and driving simulator performance. For males, the final construct sample multiple regression equation resulted in a multiple R of .69, which subsequently shrank to an R of .47 upon cross-validation. The concurrent prediction equation correctly classified 68.9% of the accident-free drivers and 71.2% of the 30 accident drivers. However, these validations were overestimates of what would be attained on a normative population of drivers. The variables significant in cross-validation were marital status, mileage, traffic conviction record, socioeconomic factors, ratings of one's driving ability compared to elderly drivers, and personality and attitudinal factors. None of the perceptual-motor and simulator performance measures proved significant, although there was some suggestive relationship between simulator speed variability, two psychomotor measures, and field dependence and accidents. The findings suggest that a combination of cluster analysis and multiple regression analysis is a more powerful method than either alone, and that conventional multiple regression procedures can obscure complex relationships.

by R. M. Harano; R. C. Peck; R. S. McBride
Contract HPR-PR-1(8)-B0132
Publ: JOURNAL OF SAFETY RESEARCH v7 n1 p16-52
(Mar 1975)

1975 ; 82refs
Sponsored by the Federal Hwy. Administration in cooperation with the Calif. Dept. of Public Works, Div. of Hwys.
Availability: See publication

HS-016 466

KIDS AND TRAFFIC

The lack of awareness by children to surrounding traffic hazards and the additional ignorance by drivers of this unawareness is described. A Swedish study of children's traffic behavior is discussed which yields data that can be used to better educate both drivers and children. The sample consisted of 125 pedestrian children and 57 bicyclists. The most frequent mistake made by children in both cases was dashing out. Drivers did not seem to be aware that children on sidewalks and roadsides may suddenly dash out without warning into traffic; that there are certain places where one should expect children to dash out at any time; or, that a horn signal has to be given well in advance of passing if it is going to prevent accidents. When motorists encountered bicyclists, it was not unusual for them to force the bicyclists to the side of the road. The study indicates that traffic training for all ages from preschool to adulthood should be given more emphasis. This training should be continuously improved on the basis of findings in children's psychological development. Further research will be needed to make such a traffic education possible on a continuing basis.

by D. Imhulse
Publ: TRAFFIC SAFETY v75 n4 p20-1, 34 (Apr 1975)
1975
Availability: See publication

HS-016 467

ARE MEN OR WOMEN BETTER DRIVERS?

The differences between male and female driving exposure, accident involvement patterns, accident rates, and crash responsibility were examined in a review of the literature and an analysis of Texas accident data. Factors considered include miles driven, day of week, time of day, type of road, age of driver, accident severity, and type of violation. The primary findings are that men and women drive under very different circumstances, and that any difference between their accident rates merely reflects a difference between two sets of exposure variables, rather than a difference between the quality of male and female driving performance.

by K. Weber
Publ: HIT LAB REPORTS v5 n5 p1-11 (Jan 1975)
1975 ; 20refs
Availability: See publication

HS-016 468

POSTGRADUATE DRIVING

New courses designed to remind the motorist that good driving is a skill are described. The key lesson in emergency driving is to avoid panic braking and steer out of trouble if possible. The most promising programs have developed out of the special training that automobile companies give their test drivers. Details of one program are reviewed, and rules are given for situations such as oncoming obstacles, running off the road, starting to skid, blowouts, hard rain, engine failure on a hill, and head-on vehicle approaches.

by R. S. Strother
Publ: DRIVER v8 n10 p1-7 (Mar 1975)
1975
Availability: See publication

HS-016 469

STABILITY AND MANEUVERABILITY PERFORMANCE OF DIFFERENT TYPES OF BICYCLES. A LITERATURE SURVEY AND AN EXperimental study

Investigations concerning bicycles characterized by extreme handlebars and small wheel diameters are reviewed along with a discussion of an experiment with eighteen (18) 12-year-old boys in which six (6) different bicycles were evaluated in regard to their maneuverability and stability performance in a series of ten (10) tests. The bicycles used were all currently available in Sweden. Three (3) different models were used, distinguished by differences in frame construction, wheel diameter, and wheelbase, and two different handlebar types, one standard and the other extreme in height. The tests were performed at ten (10) separate stations and were designed to measure skills similar to those required in actual traffic situations. The experiment was repeated once so that at its conclusion, eighteen (18) subjects had ridden six (6) bicycles at ten (10) test stations twice, for a total of 2160 trials. The results showed that the bicycles with extreme handlebars have a worse maneuverability performance than bicycles with standard handlebars, affecting both the time expenditure and the number of errors which were committed. The modern rodeo bicycle caused approximately 50% more errors than either of

HS-016 470

the other bicycle models. The results were supported by interview data from the subjects and by analyses of bicycle accident data from other studies which indicated that bicycles with extreme handlebars were more dangerous than those with standard handlebars in actual traffic situations.

by P. W. Arnberg; T. Tyden
Statens Vag-Och Trafikinstitut, National Swedish Rd. and
Traffic Res. Inst., Stockholm
Rept. No. Report-45A ; 1974 ; 42p 21refs
Availability: Corporate author

HS-016 470

FORECASTS OF VEHICLES AND TRAFFIC IN GREAT BRITAIN: 1974 REVISION

Previous forecasts of numbers of vehicles and amounts of traffic in Great Britain are revised to take account of 1972 and 1973 data as available. Account is also taken of the energy supply and general economic situation early in 1974, and alternative low and high forecasts are given, allowing for a range of future positions for these factors. The middle forecasts suggest little growth between 1972 and 1975. The new forecasts for later years differ little from those issued in 1973. They indicate that the number of vehicles may rise from 17 million in 1973 to about 29 million by the year 2000, 25 million of them cars. Traffic volumes may increase by about 90% over the same period. The low alternative forecasts assume a low rate of growth of national income and substantial fuel price increases. This gives forecasts up to 2 million vehicles lower and traffic volumes increasing by only 70 to 80% by 2000. The high forecasts, based on rapid economic growth and stable fuel prices, are little higher than the middle ones. These forecasts are subject to considerable uncertainty, affected by ultimate saturation level of car ownership, response to changing price levels, and government actions on restraint and highway policies.

by J. C. Tanner
Transport and Road Res. Lab., Transport Operations Dept.,
Crowthorne, Berkshire, England
Rept. No. TRRL-LR-650 ; 1974 ; 82p
Availability: Corporate author

HS-016 471

ENGINE HEATERS -- FIRST AID FOR COLD WEATHER STARTING

The use of engine heaters to aid the fleet operator by reducing vehicle downtime and starting costs in cold weather and by extending engine life is described. The advantages of such heaters and their costs are discussed. The types of heaters (in-block immersion, electrically powered tank type, oil or gas heated tank type, and hot-water circulatory system) are examined in detail, with the relative cost of each. The problems inherent in such heaters are mentioned, along with the corrective steps to be taken.

by J. M. Sukala; N. Deckard
J. Jeb. Manufacturing Co.; K&R Delivery, Inc.
Publ: FLEET WEEK 74
Rept. No. SAE-740549 ; 1974 ; 8p
Availability: SAE

HS

HS-016 474

DRIVER'S USE OF INDIRECT VISIBILITY SYS

Data requirements for determining what is a good system for all drivers are examined. It is shown that tions cannot be made for the optimum system of the but the combined field of human factors engineering tics has the technical potential to provide the answer consideration is given to determination of the area of visibility, and methods for determining the ability of th to assimilate and process information to the side and the vehicle. Different optical systems are compared v ferent types of mirrors, and driver behavior factors : discussed.

by R. J. Donohue
General Motors Corp., GM Technical Center, Warren,
48090
1975 ; 4p
Prepared for Society of Photo-Optical Instrumentation
Engineers Proceedings, 26 Feb. 1975
Availability: Corporate author

HS-016 475

A DATA ACQUISITION SYSTEM FOR RESEAR STUDIES OF DRIVER PERFORMANCE IN REA TRAFFIC SITUATIONS.

A real-time data acquisition system and instrument described which was installed in a full-size North A automobile for the purposes of research studies of dri formance in real traffic situations and under various co of driver stress. The basic parameters recorded are c travelled and three primary control movements: : wheel, accelerator and brake. Provision is also made f cle yaw measurement, driver's pulse rate and perceiv mination level in night driving tasks. Other parameters recorded as dictated by project requirements. Summa given of the test conditions and principal findings of projects of the past three years in which the frequer magnitude of steering wheel movements have formed th for assessment of driver performance and task difficul application of power spectral analysis techniques appea promising, and it is in this context that the advantag highly flexible real-time data acquisition system are m parent.

by R. Sewell; C. I. Perratt
National Res. Council Canada, Ottawa, Canada
Rept. No. LTR-ST.751 ; 1975 ; 48p 15refs
Availability: Corporate author

HS-016 476

A REVIEW OF THE CALIFORNIA DRIVER TRAINING EVALUATION STUDY BY MARGAR HUBBARD JONES

The training evaluation study as conducted by Dr. J cooperation with the California State Department of Vehicles is examined from the viewpoint of its obje comparison of the effect of training of secondary scho dents by credentialled secondary school instructors : specially prepared commercial school instructors; com of standard programs with those enriched by four extra of actual driving practice for both secondary and com

schools; and, comparison of the costs of training by secondary schools with that provided by commercial schools. The review is made with particular emphasis on data reliability, sex differences, and costs.

by L. G. Goldstein
California Com. for Traffic Safety Education, 600 Sierra
Madre Villa Ave., Pasadena, Calif. 91109
1974 ; 124p
Availability: Corporate author

HS-016 478

EMERGENCY MEDICAL SERVICES IN THE CHICAGO AREA

Public and private ambulance systems in Chicago and suburban Cook County are described and evaluated. A major finding is the substantial decline in the number of private ambulance companies operating and in the availability of vehicles to the public. It is found that the availability of vehicles in both private and municipal sectors does not compare favorably with other major U.S. cities. A substantial proportion of emergency department patients clinically rated as requiring immediate medical attention have to rely on public transportation or automobile. The general nature of the recommendations made has the effect of transferring the ambulance functions of the Chicago Police Department to the fire department and of expediting the service and resources. Communications systems among the various elements of emergency medical services are examined, as well as the overall coordination of the network of services. Hospital services in the entire area are reviewed and found to compare favorably with other cities. Recommendations for system-wide implementation and for individual hospital action are made. Characteristics of patients treated at hospital emergency departments are also given, along with the financial characteristics of hospital emergency departments.

by G. Gibson; G. Bugbee; O. W. Anderson
University of Chicago, Center for Health Administration Studies
1970 ; 440p 514refs
Availability: Corporate author \$10.00

HS-016 479

U. S. METRIC STUDY. A METRIC AMERICA: A DECISION WHOSE TIME HAS COME

Historical background of the metric system is presented together with arguments in favor of conversion by the United States. It is concluded that the United States should change to the metric system of measurement through a coordinated national program. It is recommended that: Congress assign the responsibility for guiding the change and anticipating various kinds of special problems; detailed plans and timetables be worked out; early priority be given to education; Congress foster U. S. participation in international standards activities; and there be a firm national commitment to the goal. The study focuses on the debate surrounding the conversion proposal, types of measurement systems, implications of metric use and its context in the future world, benefits and costs, and the experiences of Great Britain and Japan.

by D. V. De Simone
National Bureau of Standards;
Rept. No. NBS-SP-345 ; 1971 ; 189p 40refs
Report to Congress
Availability: GPO \$2.25 S/N 0303 0884

HS-016 480

THE AUDIBLE LANDSCAPE: A MANUAL FOR HIGHWAY NOISE AND LAND USE

The effective control of undesirable effects of highway generated noise requires a three-part approach: source emission reduction; improved highway design; and, land use control, which is traditionally an area of local governmental responsibility. Administrative techniques described include zoning and other legal controls, municipal ownership, financial incentives, and municipal services. Physical techniques considered are acoustical site planning and architectural design and construction, and various noise barriers. Implementation strategies are discussed, and case studies are cited from Cerritos, California, and Somerville and Marshfield-Pembroke, Massachusetts. Noise effects, measures, standards, and predictors are included in an appendix.

Urban Systems Res. and Engineering, Inc., Cambridge, Mass.
1974 ; 96p refs
Prepared for Federal Hwy. Administration, Offices of Res. and Devel.
Availability: GPO \$1.55 S/N 5000-00079

HS-016 481

PUBLIC AWARENESS OF A NIAAA ADVERTISING CAMPAIGN AND PUBLIC ATTITUDES TOWARD DRINKING AND ALCOHOL ABUSE. PHASE 2.

The results are summarized of the second wave of interviews on the effectiveness of the advertising campaign of the National Institute on Alcohol Abuse and Alcoholism (NIAAA) dealing with the dangers of alcohol abuse and alcoholism. A national cross section of 1600 individuals was interviewed. Basic demographic data for the national cross section and the two control cities of Eugene, Oregon, and Spokane, Washington are summarized. Data are given on the awareness of the public service advertising, trends in attitudes toward alcohol, relationships between media usage and advertising awareness, supplementary data for the Department of Transportation (DOT), and additional variables relating to the advertising impact. It is shown that the advertisements have received very satisfactory usage on television and radio, and public recognition of specific messages is high. It is noted that NIAAA messages would receive more use on the air if new ads were supplied more frequently. The research shows that people who have had a direct experience with alcohol abuse have a significantly higher recall level of NIAAA messages than the general public, but they do not show a significantly more positive response to NIAAA messages on the whole.

Harris (Louis) and Associates, Inc.
1973 ; 85p
Prepared for the National Inst. on Alcohol Abuse and Alcoholism.
Availability: National Inst. on Alcohol Abuse and Alcoholism

HS-016 482

ROAD TEST AERODYNAMIC INSTRUMENTATION

Two methods for obtaining aerodynamic pitching moment and lift information have been developed using road tests of drivable vehicles. Improvements in the dynamics of manometer tubes make onboard measurement of pressure distributions feasible. A method for determining pressure distributions on a

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vehicle's underside from the road is valuable in verifying the accuracy of wind tunnel tests; no vehicle modifications are required. Both methods should improve the state-of-the-art in automobile aerodynamic instrumentation and testing.

by B. S. Buckley
Massachusetts Inst. of Tech.
Rept. No. SAE-741030 ; 1974 ; 7p 10refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 483

SOME ASPECTS OF SUSPENSION AND STEERING DESIGN FOR MODERN COMPACT CARS

Some current problems which are of particular interest with respect to driving safety when we regard the development of the chassis for compact automobiles are examined. These problems include suspension suitability for radial tires, axle kinematics, vibration characteristics, brake system design, handling, and legal requirements.

by J. H. Sorsche; K. Enke; K. Bauer
Daimler-Benz A. G.
Rept. No. SAE-741039 ; 1974 ; 10p 2refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 484

THE DESIGN CONCEPT AND TECHNIQUES OF SUSPENSION AND STEERING FOR THE 1974 TOYOTA CORONA

The 1974 Toyota Corona has been drastically changed to accommodate the required devices for emission control and to comply with safety standards. The handling and stability characteristics have been improved as well as vehicle performance. Steering effort and interior noise levels have been reduced. The details of design concepts and the techniques that were employed to produce these improvements are presented.

by A Numazawa; R. Kizu
Toyota Motor Co. Ltd.
Rept. No. SAE-741040 ; 1974 ; 9p
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 485

ROTARY COMBUSTION ENGINE TROCHOID COATINGS AND SEALS

Curtiss-Wright's efforts to identify or develop successful apex seal/trochoid sealing systems for the rotary engine are reviewed. Included are descriptions of the various wear test rigs utilized to evaluate apex seal/trochoid coating combinations. Laboratory seal-coating screening procedures are detailed along with engine test results. Seal-coating design considerations including factors affecting seal loading and wear

are described. Data are presented for plasma spray coating containing

by H. D. Lamping; M. W. Gallie
Curtiss-Wright Corp.
Rept. No. SAE-741043 ; 1974 ; 1
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 486

AUTOMOTIVE ACCESSORY DRIVE MODERN ENGINE DESIGN

An accessory drive system, used on modern engines with a fan drive, is developed for engines with a fan drive. The system can be applied to the use of a synchronous drive belt. The drive system offers savings in assembly costs due to fewer components. Benefits to the consumer include easy belt replacement.

by R. E. Semin
Goodyear Tire and Rubber Co.
Rept. No. SAE-741045 ; 1974 ; 12
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 487

CURRENT STATUS OF HIGH TEMPERATURE CERAMIC GAS TURBINE RESEARCH AND DEVELOPMENT

The development of vehicular gas turbine engines operating at temperatures up to 2500°F has been rapid. The rationale behind this engine is the use of path components being developed. Information is provided on the progress of the program.

by E. A. Fisher; A. F. McLean
Ford Motor Co.
Rept. No. SAE-741047 ; 1974 ; 7p
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974. Sponsored by the Defense Research
Projects Agency, and the Army Materiel Research Center.
Availability: SAE

HS-016 488

LEAN COMBUSTION AND TROCHOID SPARK IGNITION ENGINES

The causes of misfire by very lean mixtures are discussed. The effects of mixture preparation, mixture recirculation (simulated by nitrogen), mixture ratio, intake mixture temperature, number of spark plugs and their location, minimum advance for best torque, lean mixture operation, propane and isobutane showed that leaner operation was possible with mixture preparation, increased airflow, increased compression ratio, and decreased engine speed, more

September 30, 1975

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multiple spark plugs. The dominant factors responsible for these effects were mixture homogeneity, charge dilution, and charge temperature. In most cases, at the lean limit the combustion duration (in crank angle degrees) reached a limiting value. The significance of these findings together with the exhaust emission and fuel consumption results are presented and discussed.

by A. A. Quader
General Motors Res. Lab.
Rept. No. SAE-741055 ; 1974 ; 20p 21refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 489

HIGH SPEED KNOCK IN S. I. ENGINES

Four aspects of high speed knock in spark ignition engines are examined: knock intensity levels encountered during actual service operation of European cars; knock intensity levels that do not cause engine damage in endurance tests; factors affecting the knocking behavior of a fuel; and the meaning of the knock rating characteristics of a gasoline using the research and motor methods. It was found that the most severe knocking conditions were those met with by small displacement engines at a sufficiently high constant speed (4000-5000 rpm) and wide-open throttle. In these conditions, high knock intensities, much greater than the trace level, are needed to cause engine damage. Motor octane number is the most important parameter in controlling high-speed knock at all engine speeds. This was determined using the CFR engine under fuel stress conditions very similar to those present in commercial engines.

by V. Arrigoni; G. M. Cornetti; G. Spallanzani; F. Calvi; A. Tontodonati
Snam Progetti, Petroleum Products Labs., Italy; Alfa Romeo, Italy; Fiat Res. Labs., Italy
Rept. No. SAE-741056 ; 1974 ; 26p 20refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 490

PREDICTION OF THE COMBUSTION PROPERTIES OF GASOLINES FROM THE ANALYSIS OF THEIR COMPOSITION

Some equations have been statistically obtained for calculating the combustion properties of gasolines from simple analytical data like density and FIA analysis (hydrocarbon composition: saturates, olefins, aromatics) or PONA analysis (hydrocarbon composition: paraffins, olefins, naphthenes, aromatics). Multiple correlation analysis was applied to data calculated for 66 commercial and 58 experimental gasolines knowing their GC composition and the properties of each hydrocarbon which were obtained from the literature. The heat of combustion, and the carbon to hydrogen (C/H) ratio calculated by means of these equations have been experimentally verified by means of normal analytical methods. Good agreement was found for both these quantities and for the other combustion characteristics, such as air to fuel ratio, water of combustion, and molecular expansion, all of which are directly related to the above. The statistical analysis is based on the FIA and PONA

data, and the validity of the equations obtained only holds for the field of applicability of these analytical methods.

by S. Sirtori; P. Garibaldi; F. A. Vicenzetto
Alfa Romeo, Italy; Snam Progetti, Italy
Rept. No. SAE-741058 ; 1974 ; 16p 5refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 491

APEX SEAL WEAR IN A MAZDA ROTARY ENGINE--EFFECTS OF FUEL AND LUBRICANT PROPERTIES UTILIZING RADIOISOTOPE TEST TECHNIQUES

Apex seal wear is examined in a study using radioisotope test techniques. Test data showing the effects of lubricant viscosity and quantity and the influence of various engine oil and fuel additives on apex seal wear are presented. Radioisotope test data are compared to seal wear results of long-duration tests to demonstrate the validity of radioisotope test results.

by T. H. Hacha
Standard Oil Co., Ohio
Rept. No. SAE-741067 ; 1974 ; 11p 2refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 492

RATING METHOD AND LUBRICANT APPETITE STUDY FOR AN AIR-COOLED ROTARY ENGINE

Experimental results with a 25-hp charge-cooled rotary combustion engine are presented for a variety of lubricant base stocks and additive packages. A rating method which combines endurance and deposition level is described. Lubricant performance is evaluated based upon this rating scheme, and contribution of base stock and additive package components is analyzed.

by J. A. Russell; S. J. Lestz
United States Army
Rept. No. SAE-741068 ; 1974 ; 23p 10refs
Presented at the Automobile Engineering Meeting, Toronto,
Canada, 21-25 Oct 1974. Sponsored by the U. S. Army
Mobility Equipment Res. and Devel. Center, Petroleum and
Materials Dept., Ft. Belvoir, Va.
Availability: SAE

HS-016 493

MASS BURNING RATE IN A ROTARY COMBUSTION ENGINE

The mass-burning rate in a rotary combustion engine which is calculated through an iterative constituent and energy constraints during the combustion process is reported. First approximation is obtained through the firing and motoring-pressure trace as recorded by an image-retaining oscilloscope and recorded subsequently by a polaroid camera. Effect of engine load, engine speed, relative (A/F) on the mass-burning rate

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and maximum heat release rate were studied. Three different types of fuels were used in the experimental test runs.

by K. C. Tsao; D. Losinger
Wisconsin Univ.
Rept. No. SAE-741089 ; 1974 ; 14p 12refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974. Sponsored in part by the Dept. of Natural Resource, State of Wis., the National Science Foundation and the Wis. Alumni Res. Foundation.
Availability: SAE

HS-016 494

A REAL TIME DATA SYSTEM FOR INERTIAL DYNAMOMETER BRAKE TESTS

Factors which govern the selection and application of a computer based real time data acquisition system are identified. The impact of programming language level as it affects both hardware and personnel requirements is noted. Interface considerations with the laboratory test facility are presented.

by C. E. Bridge; M. E. Gatt; D. W. Howard
Bendix Corp., Automotive Controls Systems Group
Rept. No. SAE-741094 ; 1974 ; 7p
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 495

THE EFFECT OF SELECTED COOLANTS ON METAL TEMPERATURES IN A ROTARY ENGINE

The metal temperatures of many points of the rotary engine with standard and experimental coolants were studied in an attempt to develop a product with superior heat rejection properties in a conventional cooling system. The engine used was a two-rotor liquid-cooled Wankel engine from a 1972 Mazda R-100. Both road and chassis dynamometer evaluations were run over a wide range of operating conditions to obtain a comprehensive look at coolant performance. The parameters studied for each coolant were road speed, engine load, coolant concentration, and ambient temperature; the coolants tested were ethylene glycol, water, and the experimental coolants XA-1318L and XA-1318.1L. Pure water was found to produce the lowest rotor housing metal temperatures under mild conditions of the four fluids tested; ethylene glycol produced metal housing temperatures above acceptable levels under severe test conditions. Both experimental coolants reduced peak rotor housing metal temperatures compared to ethylene glycol, although XA-1318L was slightly inferior. Under more severe test conditions, the two experimental brands were the most effective in reducing metal housing temperatures. It was concluded that XA-1318L or XA-1318.1L would be satisfactory coolants in a rotary engine.

by G. A. Paul
Dow Chemical Co., Ag-Organics Dept.
Rept. No. SAE-741091 ; 1974 ; 14p 2refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HSL 75-9

HS-016 496

A PRIMER ON NONLINEAR, STEADY-STATE VEHICLE TURNING BEHAVIOR

A simple, linear vehicle model is presented which incorporates the most important characteristics of contemporary passenger cars. It is a three mass model with a fixed, inclined roll axis and linear suspension geometric and compliance characteristics. Basic concepts of understeer and oversteer are presented. Static and dynamic requirements are examined, yielding expressions relating the car's design to tire lateral load transfer, total lateral force, and turn radius. Turn kinematics give expressions for the front steer angle and sideslip angle. Suspension geometric and compliance effects describe the rear steer angle, tire inclination angles, and steering wheel angle divided by the overall steering ratio.

by R. W. Topping
B. F. Goodrich Co.
Rept. No. SAE-741096 ; 1974 ; 17p 8refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 497

THREE-DIMENSIONAL AIRFLOW VISUALIZATION BY SMOKE TUNNEL

A new smoke tunnel to visualize airflow around three dimensional models has been originated for a study of automotive aerodynamics. The necessity to develop the facility, its technical data, and some examples of visualization are discussed. The facility, whose test section is 1 m high, 1 m wide, and 1.5 m long, is provided for 1/6-scale passenger car models. Thirty-nine lines of kerosene vapor in a vertical plane make airflow clearly visible at the airspeed of 2.9 m/s. The high Reynolds number of 2.5 X 10 to the fifth power, based on wheelbase, is obtained.

by N. Oda; T. Hoshino
Isuzu Motors Ltd., Japan
Rept. No. SAE-741029 ; 1974 ; 16p 7refs
Presented at the Automobile Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-801 303

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 5, NO. 4

Case summaries are presented of recent in-depth reports submitted by NHTSA sponsored Multidisciplinary Accident Investigation Teams in a continuing series of publications. These case reports are individual, clinical studies of accidents generally involving vehicles of the last three model years of fatal, injury producing, or property damage severity (severe enough so that at least one vehicle must be towed from the scene). The Teams investigate each accident in-depth, concerning themselves with each element of the collision (human, vehicle, environment) as it interacts with each phase of the collision (pre-crash, crash, post-crash). Each of the summaries consists of identification information, basic information on the highway and vehicles involved, a description of the driver and occupants involved (with their injuries), a phase-by-phase description of the sequence of events of the collision, and a

he causal factors, conclusions and recommendations
manate for the reports. A diagram of each collision is
l.

1 Hwy. Traffic Safety Administration, Office of
it Investigation and Data Analysis, 400 7th St., S.W.,
gton, D. C. 20590
.51p
lity: NTIS

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IDISCIPLINARY ACCIDENT INVESTIGATION IARIES. VOL. 5, NO. 5

studies are presented of recent in-depth reports from
A sponsored Multidisciplinary Accident Investigation
in a continuing series of publications. These case re-
are individual, clinical studies of accidents generally in-
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racts with each phase of the collision (pre-crash, crash,
rash). Each of the summaries consists of identification
nation, basic information on the highway and vehicles in-
d, a description of the driver and occupants involved
their injuries), a phase-by-phase description of the
nce of events of the collision, and a list of the causal
rs, conclusions and recommendations which emanate from
eports. A diagram of each collision is included.

onal Highway Traffic Safety Administration, Washington,
20590
; 298p
lability: NTIS

801 320

E INFLUENCE OF TIRE PROPERTIES ON SSENGER VEHICLE HANDLING. VOL. 4. PENDICES F--H. FINAL REPORT

pendices are given which contain the data plots from three
t programs whose overall objectives were to: identify the
roperties of tires that affect vehicle dynamic response and to
scribe those effects in quantitative terms; and to evaluate
degree to which the various tire parameters affect vehicle
namic response and to assess their relative importance. The
earch involved a laboratory tire test program to measure
performance parameters of interest (braking and lateral
ce coefficients, aligning and overturning moments, etc) on
lected tires with specified construction properties; a vehicle
st program in which the effects of tires with different pro-
erties and parameters were measured on four cars using nine
et and dry test maneuvers; and, a fundamental vehicle simu-
tion study designed to determine the effect of individual tire
rameters on various vehicle performance metrics.

alspan Corp., P. O. Box 235, 4455 Genesee St., Buffalo, N.
14221
ontract DOT-HS-053-3-727
ept. No. ZM-5350-K-4 ; 1975 ; 553p
ept. for 30 Jun 1973 - 30 Jun 1974. See also HS-801 319, 801
23 - 325.
vailability: NTIS

HS-801 351

MOTOR VEHICLE SAFETY DEFECT RECALL CAMPAIGNS, JANUARY 1, 1974 TO DECEMBER 31, 1974

Summary tabulations of recall campaigns are presented with
data derived from reports of domestic and foreign automobile
and equipment manufacturers. The tables describe the type of
safety defect, date of company notification, component af-
fected, and number of components recalled.

National Hwy. Traffic Safety Administration, Washington, D.
C.
1975 ; 95p
Availability: GPO

HS-801 356

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 6, NO. 1

Case summaries are presented of recent in-depth reports sub-
mitted by NHTSA sponsored Multidisciplinary Accident In-
vestigation Teams in a continuing series of publications. These
case reports are individual, clinical studies of accidents
generally involving vehicles of the last three model years of
fatal, injury producing, or property damage severity (severe
enough so that at least one vehicle must be towed from the
scene). The teams investigate each accident in-depth, concern-
ing themselves with each element of the collision (human,
vehicle, environment) as it interacts with each phase of the
collision (pre-crash, crash, post-crash). Each of the summaries
consists of identification information, basic information on the
highway and vehicles involved, a description of the driver and
occupants involved (with their injuries), a phase-by-phase
description of the sequence of events of the collision, and a
list of the causal factors, conclusions and recommendations
which emanate for the reports. A diagram of each collision is
included.

National Highway Traffic Safety Admin., Washington, D.C.
20590
1975 ; 360p
Availability: NTIS

HS-801 357

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 6, NO. 2

Case summaries are presented of recent in-depth reports sub-
mitted by NHTSA sponsored Multidisciplinary Accident In-
vestigation Teams in a continuing series of publications. These
case reports are individual, clinical studies of accidents
generally involving vehicles of the last three model years of
fatal, injury producing, or property damage severity (severe
enough so that at least one vehicle must be towed from the
scene). The teams investigate each accident in-depth, concern-
ing themselves with each element of the collision (human,
vehicle, environment) as it interacts with each phase of the
collision (pre-crash, crash, post-crash). Each of the summaries
consists of identification information, basic information on the
highway and vehicles involved, a description of the driver and
occupants involved (with their injuries), a phase-by-phase
description of the sequence of events of the collision, and a
list of the causal factors, conclusions and recommendations

HS-801 429

which emanate for the reports. A diagram of each collision is included.

National Highway Traffic Safety Administration, Washington, D.C. 20590
1975 ; 365p
Availability: NTIS

HS-801 429

SAFETY HELMET PERFORMANCE INVESTIGATION. VOL. 1. FINAL REPORT

The capability of the best available helmets to meet the Head Injury Criterion (HIC) is examined with particular emphasis on helmets recently developed to improve impact attenuation. Performance was correlated of similar helmets when tested for impact attenuation using both a magnesium alloy headform and a similar headform constructed to be more like the human head. The following conclusions are drawn: None of the helmet models tested passed the HIC of 1000 for all impact conditions. A soft headform did not produce significantly lower accelerations. There is a variation of test results among helmets of the same model which are attributable to manufacturing and materials variations. Impact tests with the Royal Industries drop frame assembly generally have lower acceleration dwell times than tests with the SwRI drop frame assembly.

by T. D. Dunham; A. Nagy; W. J. Astleford; M. A. Sissung; L. M. Yeakley
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex. 78284
Contract DOT-HS-4-00802
1974 ; 236p
Rept. for 18 Oct 1973-1 Nov 1974. Vol. 2 is HS-801 548. For raw back-up data, ref. only, see HS-801 549--HS-801 555.
Availability: NTIS

HS-801 430

INVESTIGATION OF INERTIAL PROPERTIES OF THE HUMAN BODY. FINAL REPORT

Knowledge of the anthropometric parameters of the human body is essential for understanding of human kinetics and particularly for the design and testing of impact protective systems. Considerable information is available on the size, weight and center of mass of the body and its segments. This report supplements existing information with data regarding mass distribution characteristics of the human body as described by the principal moments of inertia and their orientation to body and segment anthropometry. The weight, center of mass location and principal moments of inertia of six cadavers were measured, the cadavers were then segmented and the mass, center of mass, moments of inertia and volume were measured on the 14 segments from each cadaver. Standard and three-dimensional anthropometry of the body and segments was also determined. The mathematical rationale and the techniques of measurement are described in detail. Results of the investigation are given as individual data values as well as summary statistics.

by R.F. Chandler; C. E. Clauser; J. T. McConville; H. M. Reynolds; J. W. Young
Aerospace Medical Res. Lab., Wright-Patterson AFB, Ohio; 45433; Civil Aeromedical Inst., FAA Aeromedical Center, P.O.

HSL 75-9

Box 25082, Oklahoma City, Okla. 73125; Webb Associates, Inc., P.O. Box 308, Yellow Springs, Ohio 45387
Contract DOT-HS-017-2-315-1A
Rept. No. AMRL-TR-74-137 ; 1975 ; 170p 62refs
Rept. for Apr 1972-Dec 1974.
Availability: NTIS

HS-801 474

BODY VEHICLE INTERACTION: EXPERIMENTAL STUDY. VOL. 2. TECHNICAL DISCUSSION. FINAL REPORT

Injuries sustained by the lower body of a standing adult pedestrian when impacted with the front portion of a vehicle were examined in an experimental study. Fifteen unembalmed cadavers were impacted at vehicle speeds between 10 and 30 mph with a vehicle simulation consisting of two impactors: hood edge and bumper. Various vehicle geometries and surface compliances, representative of both current production and candidate injury attenuating designs, were investigated. The results indicate that injuries to the lower body of an adult pedestrian are strongly dependent upon vehicle design, particularly the height and compliance of the vehicle impact surfaces.

by H. B. Pritz; E. B. Weis; J. T. Herridge
Battelle Columbus Labs., 505 King Ave., Columbus, Ohio 43201
Contract DOT-HS-361-3-745
1975 ; 120p
Rept. for Jul 1973-Feb 1975. Vol. 1, summary, is HS-801 473.
Availability: NTIS

HS-801 475

MODULAR APPROACH TO STRUCTURAL SIMULATION FOR VEHICLE CRASHWORTHINESS PREDICTION. FINAL REPORT

A modular formulation for simulation of the structural deformation and deceleration of a vehicle for crashworthiness and collision compatibility is presented. This formulation includes three dimensional beam elements, various spring elements, rigid body elements, and modal elements.

by P. Tong; J. N. Rossettos
Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142
Rept. No. DOT-TSC-NHTSA-74-7 ; 1975 ; 37p 12refs
Rept. for Jul-Oct 1974.
Availability: NTIS

HS-801 479

MOTOR VEHICLE SAFETY DEFECT RECALL CAMPAIGNS--DETAILED REPORTS FROM OCTOBER 1 TO DECEMBER 31, 1974

Letters of notification and other communications to dealers and their customers regarding possible defects in vehicles produced by domestic and foreign manufacturers are presented without commentary.

National Hwy. Traffic Safety Administration, Washington, D. C. 20590
1975 ; 836p
Rept. for 1 Oct-31 Dec 1974.
Availability: NTIS

er 30, 1975

HS-801 512

0

**NATIONAL CONGRESS ON AUTOMOTIVE
(3RD) PROCEEDINGS, SAN FRANCISCO,
-17, 1974. VOL. 1, SUPPLEMENT**

ize is discussed in terms of future vehicle mix and e safety. Vehicle factors affecting pedestrian and safety are stressed. Papers are presented on: patterns rian and bicyclist injuries; safety compatibility of dife vehicles; distributions of accident losses for bicy- different size vehicles; and the vehicle-pedestrian- mix. Specific topics include injury models, motorcy- ents, tissue damage prediction, crash survivability, cars, seat belt effectiveness, school child accidents, idents, and Australian and Tokyo statistics.

Motor Vehicle Safety Advisory Council, Dept. of tation, 400 7th St., S. W., Washington, D. C. 20590
5p refs
ly announced as HS-015 190 (some papers omitted).
ity: NTIS

481

**NATIONAL CONGRESS ON AUTOMOTIVE
Y (3RD) PROCEEDINGS, SAN FRANCISCO,
15-17 1974. VOL. 2. SUPPLEMENT**

us small cars are examined in terms of future vehicle . automotive safety, as well as those vehicle factors af- pedestrian and bicyclist safety. Papers are presentēd hicle design for safety performance; compromises 1 safety, environment protection, and energy conserva- d pedestrian and bicyclist conspicuity. Specific topics : exterior vehicle design for pedestrian injury preven- hicle compatibility; vehicle pedestrian collision simula- tomobile restraint systems; small car crash safety; legal of loss risks resulting from increased numbers of small eadlights and pedestrian visibility; human factors in safety; distance judgement in child and adult pedestri- g car safety; injury prediction in subcompact vs. stan- ar collisions; accident avoidance; and the regulated au- le, transportation policy, and the energy crisis.

al Motor Vehicle Safety Advisory Council, Dept. of ortation, 400 7th St., S. W., Washington, D. C. 20590
864p refs
usly announced as HS-015 207 (some papers omitted).
bility: NTIS

1 492

**2000/AMF ESVS--FRONT-TO-FRONT IMPACT
AT 75 MPH. FINAL REPORT**

results are reported of a front-to-front collision between a 2000-lb class Experimental Safety Vehicle (ESV) and a 1b AMF ESV at a closure speed of 75 mph. The objective o assist in the understanding of problems associated with worthiness in the traffic mix; i.e., car-to-car compatibility ggressiveness. This crash test evaluated the structural in- y and dynamic response of the Fiat ESV when involved llision with a larger ESV, as well as the potential benefits locity-sensitive front-end structures to accommodate lighter ht vehicles such as the Fiat ESV. Fiat compartment in- ty was adequately maintained. The AMF vehicle's hydrau-

lic system stroked almost 20 ins. compared to the 24-in dynam- ic crush for the Fiat, indicating that the heavier AMF vehicle absorbed a significant portion of the crash energy. The coeffi- cient of restitution as well as the Fiat vertical and pitch ac- celerations were determined since these parameters influence restraint system requirements. Since no restraint systems were provided in this Fiat structural test vehicle, dummies were not used and occupant injury evaluations not determined.

by S. Davis; N. B. Johnson; K. Premji
Ultrasystems, Inc., Dynamic Science Div., 1850 W. Pinnacle
Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-4-00860
Rept. No. UI-DS-2310-74-59 ; 1975 ; 150p 2refs
Rept. for Apr - Dec 1974.
Availability: NTIS

HS-801 498

**MULTIDISCIPLINARY ACCIDENT INVESTIGATION
SUMMARIES. VOL. 6, NO. 6**

Case summaries are presented of recent in-depth reports sub- mitted by NHTSA sponsored Multidisciplinary Accident In- vestigation Teams. These case reports are individual, clinical studies of accidents, generally involving vehicles of the last three model years, of fatal, injury producing, or property damage severity (severe enough so that at least one vehicle must be towed from the scene). The Teams investigate each accident in-depth concerning themselves with each element of the collision (human, vehicle, environment) as it interacts with each phase of the collision (pre-crash, crash, post-crash). Each of the summaries consists of identification information, basic information on the highway and vehicles involved, a descrip- tion of the driver and occupants involved (with their injuries), a phase-by-phase description of the sequence of events of the collision, and a list of the causal factors, conclusions and recommendations which emanate for the reports. A diagram of each collision is included.

National Hwy. Traffic Safety Administration, Office of Accident Investigation and Data Analysis, 400 7th St., S. W., Washington, D. C. 20590
1975 ; 319p
Availability: NTIS

HS-801 512

**MULTIDISCIPLINARY ACCIDENT INVESTIGATION.
CASE NO. TAC-SP-74-5. SCHOOL BUS--RAN OFF
ROAD/FIXED OBJECT. TRI-LEVEL STUDY OF THE
CAUSES OF TRAFFIC ACCIDENTS**

An in-depth, multidisciplinary report of a school bus accident in which 13 occupants were injured is presented. Four Federal Motor Vehicle Safety Standards and Highway Safety Program Standards were considered relevant to this accident: FMVSS 201, Occupant Protection in Interior Impact; FMVSS 208, Occupant Crash Protection; HSPS 1, Periodic Motor Vehicle In- spection; and HSPS 17, Pupil Transportation Safety. Conclusion was drawn that better padding might have mitigated inju- ries, that availability and use of seat belts would have lessened

HS-801 537

injuries, and that the accident was caused by brake failure after improper wheel cylinder push rod installation.

by K. B. Joscelyn; J. R. Treat
Institute for Res. in Public Safety, Indiana Univ., 400 E. 7th
St., Bloomington, Ind. 47401
Contract DOT-HS-034-3-535
Rept. No. TAC-SP-74-5 ; 1975 ; 20p
Availability: NTIS

HS-801 537

**TRAINING FOR SOCIAL AND HEALTH CARE
PERSONNEL--CURRICULUM DEVELOPMENT,
EVALUATION AND CONDUCTING A PILOT TEST.
LEADER'S MANUAL. SEMINAR ON ALCOHOL AND
SAFETY**

The leader's manual outlines his responsibilities in conducting seminars and group discussions. The small group setting is emphasized as most effective, and the inter-group competition as beneficial. Specific guidelines are offered for interpersonal relations and group management. Suggested discussion topics related to alcohol and highway safety are outlined along with the necessary materials and physical setting.

National Hwy. Traffic Safety Administration, Washington, D.
C.
Contract DOT-HS-168-2-286
1974 ; 35p
Availability: GPO \$0.85. Stock No. 5003-00184

HS-801 538

**TRAINING FOR SOCIAL AND HEALTH CARE
PERSONNEL--CURRICULUM DEVELOPMENT,
EVALUATION AND CONDUCTING A PILOT TEST.
PARTICIPANT'S MANUAL. SEMINAR ON ALCOHOL
AND SAFETY**

the participant's manual for the training sessions covers various major areas of concern: seminar introduction; value exploration; seminar expectations; the problem drinking drivers; methods of coping; the interface; plans for a particular community; developing a model; and program evaluation.

National Hwy. Traffic Safety Administration, Washington, D.
C.
Contract DOT-HS-168-2-286
1974 ; 201p 84refs
Availability: GPO \$3.10. Stock no. 5003-00188

HS-801 545

**THE EVALUATION OF HIGHWAY SAFETY
PROGRAMS. FINAL REPORT OF THE TSP
EVALUATION TASK FORCE**

Responsibilities in the overall evaluation area for Traffic Safety Programs (TSP) are outlined, and a plan is suggested for meeting those responsibilities. Evaluation concepts relevant to the field of study are discussed and essential steps for evaluating highway safety program effectiveness described. Two levels of evaluation are determined: macroscopic or nationwide accident problems, and microscopic or local problems. Two levels of evaluation are identified: scientific

HSL 75-9

and administrative evaluation or monitoring. It is shown that some form of safety program management data system is needed to provide the levels of information necessary for the conduct of administrative and scientific evaluations. In general, two classes of data are currently available to TSP that are valuable in evaluating state and community highway safety programs, automatic data bases and manual files containing certain administrative evaluation data. Specific responsibilities for evaluation are recommended for each organizational level within TSP, the regions, the states, and the agencies within states. It is concluded that some level of evaluation can be conducted that will provide measures of state and community safety program accomplishment; and individual standards or program elements cannot be economically evaluated in terms of their life-saving potential on a short-term basis.

by W. E. Tarrants; A. D. Jordon; A. Crancer
National Hwy. Traffic Safety Administration, Traffic Safety
Programs, Washington, D. C. 20590
1973 ; 196p 38refs
Availability: Reference copy only, not available at NTIS

HS-801 546

**CORRELATION BETWEEN TIRE ROAD TESTS AND
SELECTED LABORATORY TESTS. FINAL REPORT**

This study made use of tires from batches with a known history of failure during the Federal Motor Vehicle Safety Standard-109 Section S5.4 Test Series. Tires were subjected to nondestructive tests before road testing to ascertain if defects were present and if correlation could be established between such defects existing and failures which subsequently occurred. Testing involved fluroscopic and x-ray photographic examinations; uniformity test with lateral, radial and tangential force measurement; holographic interferometric inspection and record; and, ultrasonic examination and record. Failures in testing were a result of separation between the sidewall and the outer carcass ply at the edge of the bead turn-up on the side opposite the serial number. Each failure resulted in a relatively slow loss of air enabling the vehicle operator to bring the test vehicle to a halt before run flat damage occurred.

by J. E. Dobbins
Nevada Automotive Test Center, Carson City, Nev. 89701
Contract FH-11-7427

170p
Prepared for the Federal Highway Administration and the
National Highway Safety Bureau
Availability: Reference copy only. Not available at NTIS

HS-801 549

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 1. MOTORCYCLE HELMET TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (August 20, 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SWRI-02-3820 ; 1973 ; 223p
See also HS-801 550--HS-801 555.
Availability: Reference copy only. Not available at NTIS

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 2. MOTORCYCLE HELMETS WITH
MAGNESIUM HEADFORM TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (August 20, 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SwRI-02-3820 ; 1974 ; 184p
See also HS-801 549, HS-801 551--HS-801 555.
Availability: Reference copy only. Not Available at NTIS

HS-801 551

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 2. MOTORCYCLE HELMETS WITH SWRI
SOFT HEADFORM TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (August 20, 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SwRI-02-3820 ; 1974 ; 130p
See also HS-801 549--HS-801 550, HS-801 552--HS-801 555.
Availability: Reference copy only. Not available at NTIS

HS-801 552

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 3. MOTORCYCLE HELMETS WITH
MAGNESIUM HEADFORM TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (20 August 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SwRI-02-3820 ; 1974 ; 132p
See also HS-801 549--HS-801 551, HS-801 553--HS-801 555.
Availability: Reference copy only. Not available at NTIS

HS-801 553

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 3. MOTORCYCLE HELMETS WITH SWRI
SOFT HEADFORM TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum ac-

celeration for requirements of FMVSS No. 218 (20 August 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
1974 ; 128p
See also HS-801 549--HS-801 552, HS-801 554--HS-801 555.
Availability: Reference copy only. Not available at NTIS

HS-801 554

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 4. MOTORCYCLE HELMETS WITH
MAGNESIUM HEADFORM AND SWRI DROP
FRAME TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (20 August 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SwRI-02-3820 ; 1974 ; 55p
See also HS-801 549--HS-801 553, HS-801 555.
Availability: Reference copy only. Not available at NTIS

HS-801 555

**SAFETY HELMET PERFORMANCE EVALUATION.
GROUP 5. MOTORCYCLE HELMETS WITH
MAGNESIUM HEADFORM AND ROYAL
INDUSTRIES DROP FRAME TEST RESULTS**

A series of tests concerning the safety of motorcycle helmets were conducted and results are presented in tabular and graphic form. Testing data were compiled by impact location, impact anvil, test condition, impact velocity, maximum acceleration, and head injury criterion to show compliance rating for requirements of FMVSS No. 218 (August 20, 1973).

Southwest Res. Inst., San Antonio, Tex.
Contract DOT-HS-4-00802
Rept. No. SwRI-02-3820 ; 1974 ; 55p
See also HS-801 549--HS-801 554.
Availability: Reference copy only. Not available at NTIS

HS-801 556

**HIGHWAY SAFETY PROGRAM MANUAL. VOL. 10.
TRAFFIC RECORDS**

The manual for traffic records is designed as a guide for states and their political subdivisions to use in developing highway safety program policies and procedures. The program development and operations are detailed, including: definition and concept of a traffic records system; state traffic records committee and agency; goals of the system; assessment of resources and constraints; and development of a systems plan. Program evaluation, reports, local government participation, and approval criteria are discussed, along with exhibits of an operating program environment, organization structure of statewide programs, traffic records coordinator and program

analyst, and examples of user output reports from a state traffic records system.

National Hwy. Traffic Safety Administration, Washington, D. C.
1975 ; 110p 84refs
Availability: GPO

HS-801 560

**INJURY ASSESSMENT OF BELTED CADAVERS.
PROGRESS REPORTS NOS. 5 AND 6, NOVEMBER 1,
1974 THROUGH JANUARY 4, 1975**

Statistical data and diagrams are presented showing the results of impact tests on a belted cadaver, a 66-year-old male having a test weight of 178 lbs and a standing height of 166 cm. The total velocity change was 29.9 mph, and the maximum sled deceleration during impact was 21.4 g. Computer plots derived from digitized test data for the impact sled deceleration and velocity versus time are shown. Head accelerometer measurements are given. The cadaver preparation and autopsy are discussed in a medical report. Since conducting the first cadaver test, the technique for arterial system pressurization has been refined to allow quicker pressurization and automatic control of the pressure decay for the period following suspension introduction and sled launch.

by J. R. Cromack
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284
Contract DOT-HS-4-00998
Rept. No. PR-5; PR-6 ; 1974 ; 39p
Availability: NHTSA

HS-801 562

**INJURY ASSESSMENT OF BELTED CADAVERS.
PROGRESS REPORT NO. 7, JANUARY 5 THROUGH
FEBRUARY 1, 1975**

This 61-year-old 137-lb 69.7 in. subject was impacted at a velocity change of 29.9 mph and impact acceleration of 20.5 g. All joints and the spine were completely flexible. A problem was encountered due to a leak from around the catheter in the left carotid artery as a result of which adequate pressurization of the arterial system immediately prior to impact could not be obtained. Good increase of intraarterial pressure was achieved upon impact. No information is available as to the degree of generalized osteoporosis suffered by the subject impacted at 29.9 mph, six days post mortem after suffering from several severely degenerative diseases for a long period. Significant injuries in one anatomical area, the chest wall, were sustained, consisting of multiple rib fractures, rib separations from sternal attachments and a comminuted, sternal fracture. No underlying organ damage of the thoracic cavity, peritoneal cavity or the brain were found. These chest wall injuries in this subject are probably immediately life threatening at the scene and would be recorded as 4 on the Abbreviated Injury Scale.

by J. R. Cromack
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284
Contract DOT-HS-4-00998
Rept. No. PR-7 ; 1975 ; 35p
Availability: NHTSA

HS-801 563

**INJURY ASSESSMENT OF BELTED CADAVERS.
PROGRESS REPORT NO. 8, FEBRUARY 1 TO
MARCH 7, 1975**

A 64-year-old subject was impacted at a velocity change of 29.4 mph and acceleration of 20.6 g. All joints were mobile and the spine supple. As was true in each of the prior tests, with the exception of Man 2, multiple rib injuries were found, but in this case, no fracture of the sternum was seen. This is probably a function of the fact that the sensor for the chest deflection measurement device cushioned the area and also shifted the over-the-shoulder belt up and to the left of the sternum so that its main force was directed against the left ribs in the parasternal area. In two instances now (Man 3 and Man 4) a known leak was present in the arterial system so that pressurization to 80-110 mph Hg could not be obtained. The question is raised as to whether pressurization of the aorta adds significant information as to large vessel vascular pressure surges associated with impact acceleration and three point seat belt restraint. Injuries sustained by the subject consisted of a compression fracture of the body of C5 vertebra without cord damage, and multiple rib fractures with the production of flail chest. No underlying organ damage of the thoracic cavity or brain were found. Aortic perforation had occurred in the antemortem period and was the proximate cause of death. The chest wall injuries are probably immediately life threatening at the scene and would thus be recorded as 4 on the Abbreviated Injury Scale.

by J. R. Cromack
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284
Contract DOT-HS-4-00998
Rept. No. PR-8 ; 1975 ; 29p
Availability: NHTSA

HS-801 564

**INJURY ASSESSMENT OF BELTED CADAVERS.
PROGRESS REPORT NO. 9, MARCH 8 TO APRIL 4,
1975**

The test of a Minicar inflatable belt is described with consideration given to the attachment points utilized on the Minicars buck. As cadavers become available, the Minicars system will be fitted to the SwRI buck and tests conducted. Appendices are provided on the ultrasonic deflectometer development and the monthly medical report.

by J. R. Cromack
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284
Contract DOT-HS-4-00998
Rept. No. PR-9 ; 1975 ; 7p
Availability: NHTSA

HS-801 566

**EVALUATION OF A THREE-POINT HARNESS WITH
LAP BELT ATTACHED TO SEAT. PROGRESS
REPORT NOS. 1 AND 2, 13 JANUARY TO 31 MARCH
1975**

A body with integral overhead camera mount has been designed and fabricated, and a system to automatically cycle

the arterial pressure in a cadaver between a systolic pressure of 90 mm Hg and a diastolic pressure of 70 mm Hg was tested for operation under sled G loading conditions. Two systems for measuring chest deflection were also developed: a caliper device, and a system of two coaxial coils. Belt elongations were measured, and Endevco triaxial accelerometers were calibrated and mounted on the Humanoid Systems 50th percentile Dummy. Techniques for pressurizing the upper arterial system were tried on two embalmed cadavers. Sled tests were performed on two cadavers, CALMAN 1 and CALMAN 2, and another 50th percentile dummy. Incorporation of a femur load energy managing knee bar is recommended which would be large enough to accommodate the different sizes of subjects, thereby reducing some of the lap belt loads while simulating more closely the energy managing characteristics of the crush of a real vehicle lower instrument panel.

by M. J. Walsh
Calspan Corp., Buffalo, N. Y. 14221
Contract DOT-HS-5-01017
Rept. No. PR-1; PR-2; 1975 ; 20p
Availability: NHTSA

HS-801 567

**ADVANCED PASSIVE RESTRAINT SYSTEM FOR
SUBCOMPACT SIZE VEHICLE FRONT SEAT
PASSENGERS. PROGRESS REPORT NO. 10, 31
MARCH TO 27 APRIL 1975**

Evaluation sled tests are described and analyzed for adult and child dummies. It is found that the system appears capable of providing protection from fatality or serious injury to adult size occupants in a subcompact size environment up through the 40 to 50 mph crash speed regime. Because of the possible variability in test data due to specific dummy types, the somewhat uncertain differences between dummy and human response and the very large differences in real life occupant to occupant size, shape, physical condition, seating position and other factors, it does not appear warranted to draw specific quantitative conclusions regarding the efficacy of the system based specifically on the 50th percentile dummy test results.

The non-deployed system (bolster and knee bar) can provide significant protection to adult occupants. The deploying system provides a much safer crash environment to small children than the non-deploying system, provided the child is seated in a normal position. If a child is up against the system which may well be the case during a panic braking situation, the system produces more harm than good.

by D. J. Romeo
Calspan Corp., Buffalo, N. Y. 14221
Contract DOT-HS-4-00972
Rept. No. PR-10; 1975 ; 27p 1ref
Availability: NHTSA

HS-801 568

**THE EFFECT OF ENVIRONMENT ON A
TREADWEAR COURSE**

Three earlier treadwear tests on the same course are examined as to the effects of environment on the treadwear, and it is shown that the environment significantly affects the treadwear by altering the severity of the test course. As the severity of the course decreases, the tire wear is decreased in the order:

bias, belted, radial; i.e., the bias is least affected, the belted more, and the radial the most affected by decreasing severity.

by H. Williams
National Hwy. Traffic Safety Administration, Safety Res.
Lab., Washington, D. C. 20590
Rept. No. T-1013 ; 1975 ; 8p 6refs
Availability: NHTSA

HS-801 570

**COMPUTERIZED INFORMATION FOR TRAFFIC
EVALUATION (CITE). FACT SHEET CODING
MANUAL**

These instructions include procedures for preparing the data extraction documents that were designed for the Bell Gardens computerized traffic records system, Project CITE. With a system for capturing data and the use of specialized computer programs to generate unique output reports, the correlation and interpolation of facts, not previously possible, can be accomplished. These facts, when presented in a useable format, can then become the basis for more effective management of city operations, more effective and efficient personalized services for citizens, and better utilization of valuable manpower resources. The fact sheet coding manual for the CITE project provides detailed instructions which explain the allowable codes for the data field in each fact sheet and when each code is to be used. The function of the coding clerk and a description of this phase of the computerized information system in relation to associated phases is described. Coding instructions are given for traffic collision in general, traffic collision involved and injured parties, and traffic citation analysis fact sheet. Topics covered include complete description of vehicle, occupant and driver, location, time, speed, injuries, and police report. Final report of Project CITE is to provide the city with a comprehensive evaluation of traffic collisions and traffic citations along with various management and manpower utilization reports.

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens, Calif. 90201; Applied Technology, 225 Paularino Ave., Costa Mesa, Calif.

Grant G-107205

Rept. No. APD-TECH-73-6302-1 ; 1973? ; 117p

Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. See HS-801 571--HS-801 574.

Availability: Reference copy only. Not available at NTIS

HS-801 571

**COMPUTERIZED INFORMATION FOR TRAFFIC
EVALUATION (CITE). KEYPUNCH INSTRUCTIONS
MANUAL**

The keypunch instructions manual for the CITE project contains three sections which correspond to a fact sheet, and a fourth pertaining to the bicycle citation, which is keypunched directly from the citation. Each of these sections has been further subdivided into keypunch instructions and field definitions. Within each main section are figures showing related forms such as fact sheets and keypunch program cards. A fifth section is an appendix which contains a flow chart of the cod-

form.

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens, Calif. 90201; Applied Technology, 225 Paularino Ave., Costa Mesa, Calif.

Grant G-107205

Rept. No. APD-TECH-73-6302-2 ; 1973? ; 43p

Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. See HS-801 570, HS-801 572--HS-801 574.

Availability: Reference copy only. Not available at NTIS

HS-801 572

COMPUTERIZED INFORMATION FOR TRAFFIC EVALUATION (CITE). COMPUTER OPERATIONS RUN MANUAL

Detailed procedures are given for computer processing the data obtained as part of the CITE Project on traffic collisions and traffic citations. The first section of the manual explains the types of files, programs, and equipment needed to produce the reports. The second deals with each individual program and explains what files, programs, and control cards are needed to execute each program. The last section discusses job control stream, computer operator intervention if needed, and any exceptions or problems which the computer operator may encounter.

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens, Calif. 90201; Applied Technology, 225 Paularino Ave., Costa Mesa, Calif.

Grant G-107205

Rept. No. APD-TECH-73-6302-3 ; 1973? ; 97p

Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. See HS-801 570--HS-801 571, HS-801 573--HS-801 574.

Availability: Reference copy only. Not available at NTIS.

HS-801 573

COMPUTERIZED INFORMATION FOR TRAFFIC EVALUATION (CITE). SYSTEM SPECIFICATIONS AND PROGRAM DOCUMENTATION

Detailed documentation is presented for the operational system, CITE, implemented for the Bell Gardens Police Department. System specifications are outlined as to source documents, fact sheets, keypunching and verification, computer processing, reports, and system utilization. Program documentation is detailed with regard to: edit and update, age of traffic collision offenders, bicycle citations issued, collisions involving bicyclists and pedestrians, city property damage, citations written by officer and by violation, high collision locations, monthly collision analysis, primary collision factor, traffic collision summary, and traffic collisions by time of occurrence.

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens, Calif. 90201; Applied Technology, 225 Paularino Ave., Costa Mesa, Calif.

Grant G-107205

Rept. No. APD-TECH-73-6302-4 ; 1973? ; 147p

Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. See HS-801 570--HS-801 572, HS-801 574.

Availability: Reference copy only. Not available at NTIS

COMPUTERIZED INFORMATION FOR TRAFFIC EVALUATION (CITE). FINAL PROJECT REPORT

Results of a 21-month project for the development of a computerized traffic records system for the City of Bell Gardens Police Department are presented. Each step of the project design, system testing, and implementation is discussed, with major emphasis devoted to project goals and results. Where applicable, reference is made to the other four project reports that make up the system documentation. Appendices are included on progress reports, CITE management reports, system input documents, and coding fact sheets. Now operational, Project CITE provides Bell Gardens with a meaningful records system and may be utilized for both management and manpower deployment purposes. It further provides for eleven reports that reflect traffic collision and citation data in both detailed and summarized formats.

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens, Calif. 90201; Applied Technology, 225 Paularino Ave., Costa Mesa, Calif.

Grant G-107205

Rept. No. APD-TECH-73-6302-5 ; 1973? ; 118p

Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. See HS-801 570--HS-801 573.

Availability: Reference copy only. Not available at NTIS

HS-801 575

CITY OF SAN JOSE'S TRAFFIC ACCIDENT PREVENTION PROJECT. FINAL REPORT

Development of an accident prevention program that would function in a rapid and efficient manner and which could be readily adapted to the uses of other jurisdictions is described. The construction of a computer program and support systems was undertaken in which the prime consideration was the incorporation of information concerning both accident data and location data into the computerized storage system. The USIRS (User Selected Information Retrieval System) program developed and implemented is capable of providing analysis of traffic data which can satisfy the needs of San Jose's Transportation Division with regard to accident investigation, and can assist in the functions of Transportation Planning and Design. A cost-benefit analysis shows the savings in reduced personnel time for data handling and analysis. The program has been incorporated into the general procedures used within the Transportation Division and the Police Department. Further analytical work is being scheduled to increase the city's ability to locate and correct accident problems and to aid in further development of selective enforcement techniques.

Traffic Accident Prevention Squad, San Jose, Calif. 1974 ; 416p

Sponsored by the Office of Traffic Safety, State of Calif., the National Hwy. Traffic Safety Administration, and the Federal Hwy. Administration.

Availability: Reference copy only, not available at NTIS

HS-801 576

TRAFFIC RECORDS SYSTEM. CITY OF LONG BEACH. FINAL REPORT

An automated data processing system for Long Beach is described which provides the city administrator, police department, and engineering department with a management reporting system to reduce the incidence of traffic accidents. Reporting can be made on a timely basis and value judgments are possible in a shorter time frame from administrators to citizens. The project is applicable to other jurisdictions, and has been used as a prototype by other applicant agencies. Consideration is given in the report to pre-planning, consulting, schedules, payment program, geographic base file update, traffic volume flow maps, traffic collision density maps and diagrams, and traffic citation density maps.

City of Long Beach, Calif.
1973 ; 155p
Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. Prepared in cooperation with Stanford L. Optner and Associates, Los Angeles, Calif.
Availability: Reference copy only, not available at NTIS

HS-801 577

TRAFFIC RECORDS MANAGEMENT SYSTEM. SAN JOAQUIN COUNTY MUNICIPAL COURTS. FINAL REPORT

The project to develop a traffic records management system had the following objectives: to improve the timeliness of required reports to the Department of Motor Vehicles; to accomplish timely issuance of arrest warrants and input and recall notices to arresting agencies; to establish positive control over conviction reports sent to the Department of Motor Vehicles; to provide better interface with other agencies; and to establish prior violation information and bail computation consistency equitable to all violators processed through the county's courts. It was decided to develop a computerized traffic ticket processing system in-house and on-line, which would be user oriented and provide the court administrator with exclusive control of traffic citations. It was found that the new system was considerably more sophisticated than the previous one, and that all objectives were met or are being met except automating a warrant recall system and interfacing with other agencies. The system is also being used by San Joaquin County's Superior Court Juvenile Department to obtain state-wide driving history for juvenile traffic offenders.

San Joaquin County Courts, Stockton, Calif.
1974? ; 92p
Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration.
Availability: Reference copy only, not available at NTIS

HS-801 578

SOLANO COUNTY TRAFFIC RECORDS SYSTEM, CITIES IN SOLANO COUNTY AND CITIES OF NAPA AND DAVIS

An automated traffic records system implemented at the regional level is described which aimed at ensuring the availability of appropriate reports on traffic accidents and citations by location in order to support selective enforcement programs

and the planning and carrying out of safety improvements within each jurisdiction. The records system includes accident records data, citation information, geometric and traffic control device inventories, and compatibility with a statewide integrated traffic control system. The system provides the following monthly reports: monthly traffic summary, an overview of traffic patterns; accident cause and citation summary; and summary of most hazardous locations. In the hazardous location summary, a severity index puts the locations in priority order. In addition, any of a large number of selective retrieval reports are possible by any participating jurisdiction.

Solano County Data Processing Center, Fairfield, Calif.
Grant 107217
1974 ; 163p
Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration.
Availability: Reference copy only, not available at NTIS

HS-801 579

STOCKTON TRAFFIC RECORDS SYSTEM. FINAL REPORT

Development and implementation of a computer-oriented traffic collision records system is described. The city was responsible for coding and data entry of locations and existing collision and citation files, and a training program. The contractor was responsible for the review of existing systems, requirements analysis, system design and implementation planning. Responsibility was shared in computer programming and system implementation. A file initialization module was not necessary, and the original location update module was expanded to include further editing and easier police beat number updating. The system is detailed, including subsystems on location update, citation control, event update, scheduled reports, and selective retrieval. Report descriptions are included for: selective enforcement report; traffic summary; accident cause and citation summary; monthly citation analysis; accident detail report; selected locations summary; accident history of all locations; accident summary by location type; accident rank by location type; and street profile verification list. Recommendations are offered to other traffic records system developers and for improvements to the Stockton Traffic Records System.

Arthur Young and Co., 555 Capitol Mall, Sacramento, Calif.
95814
Grant 107308
1974 ; 77p
Prepared in cooperation with the Stockton, Calif. Police Dept. Sponsored by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration.
Availability: Reference copy only, not available at NTIS

HS-801 580

THE REGIONAL TRAFFIC RECORDS SYSTEM. CITY OF ARCADIA, CALIFORNIA. FINAL REPORT ANALYSIS

Development of a single automated traffic records system is described which allows all the cities of the region to operate a uniform traffic records system in a cost-effective manner. The member cities belong to the San Gabriel Valley Municipal Data Systems (MDS). The system produces the following output reports: complete information as to time, date, location, and parties involved, of every accident, plus the location with

worst accident statistics for the month; complete data relative to citations written, when, where, and by whom; traffic volumes, along a route; intersection change simulation; selective enforcement locations; and a complete inventory list of roadway descriptions. This allows the cities to identify hazardous locations, make before and after studies based on accident and citation data, and make improved use of selective enforcement. The selective data retrieval capability provides needed specific data without the production of large amounts of unused reports. Input forms and output reports are shown in some detail, and the user manual is included. Appendices give flow charts for the various file segments.

San Gabriel Valley Municipal Data System, Calif.
Rept. No. TR-7105-5105 ; 1974 ; 169p
Supported by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration.
Availability: Reference copy only, not available at NTIS

HS-801 583

CITY OF SACRAMENTO. TRAFFIC RECORDS SYSTEM DEVELOPMENT. FINAL REPORT

An automated traffic records system is described which makes possible the analysis of accident records, citations, and court dispositions of citations with respect to traffic volumes, peak flow periods, street conditions, traffic control devices, manpower utilization, and any other significant factors which help to direct and redirect the work of the police and traffic engineering departments, as well as the court's understanding and treatment of traffic citations, and a public information program for citizens. The methodology is detailed, and the contribution of the system to both city and state traffic safety is examined. A cost-benefit analysis is also described, along with problems and philosophy. The system user manual is included.

by J. W. Chandler
City of Sacramento, Dept. of Data Processing, 819 Tenth St., Sacramento, Calif. 95814
Rept. No. TR-7108-5105 ; 1974 ; 272p
Supported by the Office of Traffic Safety, State of Calif. and the National Hwy. Traffic Safety Administration. Rept. for 1 Jul 1971-30 Jun 1974.
Availability: Reference copy only, not available at NTIS

HS-801 585

UNIFORM TIRE QUALITY GRADING. TEST FOR TEMPERATURE RESISTANCE. FINAL REPORT

A modified, short procedure for grading the temperature resistance of tires has been tested and compared with results obtained in a similar but longer test. The observed speeds at failure on a small sample of duplicate tires are reasonably consistent. Findings were: 4.7% of the tires tested failed to meet the minimum standard, 57% fell in the grade C range, 36% in

grade B, and 2.3% in grade A.

by P. L. Moore; F. C. Brenner
National Hwy. Traffic Safety Administration, Safety Res. Lab.
Washington, D. C. 20590
Rept. No. T-1015 ; 1975 ; 6p 2refs
On cover: Tire Systems. Uniform Tire Quality....
Availability: NHTSA
HS-801 586

UNIFORM TIRE QUALITY GRADING. TREADWEAR PHASE 2. FINAL REPORT

Treadwear testing is described which aimed at determining vehicle reaction on the 8.55-15 SAE bias constructed standard traction tire. Two types of vehicles were used with different forms of suspensions as well as cross reference bias-belted set of tires to act as an index. All but one tire in one of the comparison groups failed, and it would not seem that it would be possible to draw any valid conclusions as to the effect of vehicle reaction on wear rates on the SAE tire. Route changes were also made in an attempt to obtain a required wear percentage.

Compliance Testing, Inc., 1150 N. Freedom St., Ravenna, Ohio 44266
Contract DOT-HS-026-3-605
Rept. No. DOT-TST-72-1 ; 1974 ; 66p
Modification 1.
Availability: NTIS

HS-801 587

DEVELOPMENT OF IMPROVED INFLATION TECHNIQUES. TASK 3--SYSTEM PERFORMANCE EVALUATION. PROGRESS REPORT NO. 12, 1 OCTOBER TO 31 OCTOBER 1974

Air bag deployment effectiveness was tested, and sled test results with a 50th percentile male at 50 mph and static out-of-position, 6-year-old were within the requirements. The results with the 50 mph out-of-position child were marginal on the chest. Additional static tests with and without the child, and initial sled tests were conducted during this reporting period. Eleven static tests revealed that the bag folding appeared to have more effect on the loadings and ride back than the small changes in gas flow. With the bag rolled under, the child was pushed back high onto the top part of the seat but the head and chest loadings were within limits. With the bag rolled up from the bottom the ride back was good but the head loadings were excessive. Nine sled tests showed the need for system changes which should consist of a bag configuration modification to reduce neck bending.

Olin Corp., Energy Systems Operation, Marion, Ill. 62959
Contract DOT-HS-345-3-691
Rept. No. PR-12 ; 1974 ; 13p
Availability: NHTSA

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FIAT 2000/AMF ESVS--FRONT-TO-FRONT IMPACT TEST AT 75 MPH. FINAL REPORT
HS-801 492
- Uniroyal Tire Co.
SUMMATION OF PAPERS
HS-016 411
- Uniroyal, Inc.
THE INFLUENCE OF TIRE WEAR ON STEERING PROPERTIES AND THE CORRESPONDING STRESSES AT THE TREAD-ROAD INTERFERENCE
HS-016 400
- United States Army
RATING METHOD AND LUBRICANT APPETITE STUDY FOR AN AIR-COOLED ROTARY ENGINE
HS-016 492
- University of Bath, School of Engineering, Bath, England
THE DIFFERENTIAL COMPOUND ENGINE--PT. 1: STEADY-STATE AND EMISSION CHARACTERISTICS
HS-016 336

THE DIFFERENTIAL COMPOUND ENGINE--P1. 2.
TRANSIENT RESPONSE OF THE DIFFERENTIAL
COMPOUND ENGINE (DCE) COMPARED WITH CON-
VENTIONAL TURBOCHARGED ENGINES

HS-016 337

University of California Berkeley, Dept. of Mechanical
Engineering

AIRFLOW BENEATH AN AUTOMOBILE

HS-016 430

University of Chicago, Center for Health Administration
Studies

EMERGENCY MEDICAL SERVICES IN THE CHICAGO
AREA

HS-016 478

University of Technology, England

TEMPERATURE HISTORY IN THE COMBUSTION
CHAMBER OF A SPARK IGNITION ENGINE

HS-016 427

Urban Systems Res. and Engineering, Inc., Cambridge,
Mass.

THE AUDIBLE LANDSCAPE: A MANUAL FOR
HIGHWAY NOISE AND LAND USE

HS-016 480

Vandervell Products Ltd., England

COMPUTER ANALYSIS OF BEARINGS IN ROTARY
ENGINES

HS-016 428

Vauxhall Motor Ltd., Environmental Activities Staff,

P.O. Box No. 3, Luton, Beds., England

TRIAL BY ORGANIZATION AND ORDEAL: AN EN-
GINEER'S SEARCH FOR QUALITY

HS-016 375

Volkswagenwerk A. G.

TESTING VEHICLES AND COMPONENTS WITH SER-
VOHYDRAULIC LOAD UNITS

HS-016 342

Volkswagenwerk AG (Germany), Research and
Development

DRIVING SIMULATOR STUDIES: THE INFLUENCE
OF VEHICLE PARAMETERS ON SAFETY IN CRITI-
CAL SITUATIONS

HS-016 403

Volvo A.B., Truck Div.

THE DEPENDABILITY OF AUTOMATIC ENGINE
TEST BEDS

HS-016 333

Wallace Murray Corp.

DESIGNING THE ENGINE COOLING FAN

HS-016 331

Wayne State Univ., Dept. of Mechanical Engineering

Sciences, Detroit, Mich. 48202

FRONTAL CRASH EVALUATION TESTS OF THE GM
CHILD SEAT HARNESS

HS-016 368

Webb Associates, Inc., P.O. Box 308, Yellow Springs,
Ohio 45387

INVESTIGATION OF INERTIAL PROPERTIES OF THE
HUMAN BODY. FINAL REPORT

HS-801 430

Wisconsin Univ.

MASS BURNING RATE IN A ROTARY COMBUSTION
ENGINE

HS-016 493

Wright (Barry) Corp., Barry Div.

DYNAMIC CHARACTERISTICS OF AN ELASTOMER-
IC-PNEUMATIC ISOLATOR WITH ORIFICE-TYPE
RELAXATION DAMPING FOR VEHICULAR SUSPEN-
SION APPLICATIONS

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45433

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Calspan Corp., Buffalo, N. Y. 14221

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DOT-HS-4-00944
National Hwy. Traffic Safety Administration; Society of
Automotive Engineers, Inc. HS-016 392

DOT-FH-11-7966
Peat, Marwick, Mitchell and Co., 1025 Connecticut Ave.,
N.W., Washington, D. C. 20590

HS-016 285

DOT-HS-4-00972
Calspan Corp., Buffalo, N. Y. 14221 HS-801 567

DOT-HS-026-3-605
Compliance Testing, Inc., 1150 N. Freedom St., Ravenna,
Ohio 44266

HS-801 586

DOT-HS-4-00998
Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284 HS-801 560

DOT-HS-034-3-535
Institute for Res. in Public Safety, Indiana Univ., 400 E. 7th
St., Bloomington, Ind. 47401

HS-801 512

Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284 HS-801 562

DOT-HS-053-3-727
Calspan Corp., P. O. Box 235, 4455 Genesee St., Buffalo, N.
Y. 14221

HS-801 320

Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284 HS-801 563

Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284 HS-801 564

DOT-HS-168-2-286
National Hwy. Traffic Safety Administration, Washington,
D. C.

HS-801 537

DOT-HS-5-01017
Calspan Corp., Buffalo, N. Y. 14221 HS-801 566

National Hwy. Traffic Safety Administration, Washington,
D. C.

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DOT-TSC-628
Southwest Res. Inst. HS-016 414

DOT-HS-345-3-691
Olin Corp., Energy Systems Operation, Marion, Ill. 62959

HS-801 587

DOT-TSC-692
Department of Transportation, Transportation Systems
Center, Kendall Square, Cambridge, Mass. 02142 HS-016 288

DOT-HS-361-3-745
Battelle Columbus Labs., 505 King Ave., Columbus, Ohio
43201

HS-801 474

EPA-R-800-729-03-01
Massachusetts Inst. of Tech. HS-016 345

DOT-HS-4-00802
Southwest Res. Inst., San Antonio, Tex.

HS-801 551

FH-11-7427
Nevada Automotive Test Center, Carson City, Nev. 89701
HS-801 546

Southwest Res. Inst., San Antonio, Tex.

HS-801 549

G-107205
City of Bell Gardens, 7100 Garfield Ave., Bell Gardens,
Calif. 90201; Applied Technology, 225 Paularino Ave., Costa
Mesa, Calif. HS-801 570

Southwest Res. Inst., San Antonio, Tex.

HS-801 550

Southwest Res. Inst., San Antonio, Tex.

HS-801 552

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens,
Calif. 90201; Applied Technology, 225 Paularino Ave., Costa
Mesa, Calif. HS-801 571

Southwest Res. Inst., San Antonio, Tex.

HS-801 553

Southwest Res. Inst., San Antonio, Tex.

HS-801 554

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens,
Calif. 90201; Applied Technology, 225 Paularino Ave., Costa
Mesa, Calif. HS-801 572

Southwest Res. Inst., San Antonio, Tex.

HS-801 555

Southwest Res. Inst., 8500 Culebra Rd., San Antonio, Tex.
78284

HS-801 429

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens,
Calif. 90201; Applied Technology, 225 Paularino Ave., Costa
Mesa, Calif. HS-801 573

DOT-HS-4-00860
Ultrasystems, Inc., Dynamic Science Div., 1850 W. Pinnacle
Peak Rd., Phoenix, Ariz. 85027

HS-801 492

City of Bell Gardens, 7100 Garfield Ave., Bell Gardens,
Calif. 90201; Applied Technology, 225 Paularino Ave., Costa
Mesa, Calif. HS-801 574

HSL 75-9

NSF-GK-15409

Massachusetts Inst. of Tech.

HS-016 427

HS-016 345

107217

Solano County Data Processing Center, Fairfield, Calif.

HS-801 578

P.O.-3-1-1011

National Bureau of Standards, Washington, D. C. 20234

HS-016 323

107308

Arthur Young and Co., 555 Capitol Mall, Sacramento, Calif.
95814

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SRC-B/RG/031

Colgate Univ.; University of Technology, England

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CONTRACTS AWARDED

DOT-HS-5-01164

REVISION AND EXPANSION OF NBS MONOGRAPH 122, MECHANICS OF PNEUMATIC TIRES

Recommendations for an updated revision of Monograph 122 are to include areas where significant advancements have been made since it was first published.

The Regents of the University of Michigan 260 Research Bldg.
Ann Arbor, Mich. 48105
To be completed one (1) year from date of contract award
\$20,225.00

FH-11-7543 Mod. 21

PROJECT CRASH

To monitor the continuing effort in Vermont to reduce fatal and injury crashes caused by the alcohol impaired driver, the contractor shall continue data collection, submit annual reports, and conduct studies of evaluation covering calendar years 1975 and 1976. the

State of Vermont Department of Mental Health 79 River St., -
Heritage II Montpelier, Vt. 05602
Extended to 30 Jun 77
Increased \$122,541.00

DOT-HS-4-00853 Mod. 4

HANDLING TEST PROCEDURES FOR LIGHT TRUCKS, VANS, AND RECREATIONAL VEHICLES

Verification test of the Ford pick-up without camper is eliminated while comprehensive tests on five (5) vehicles will be performed to measure vehicle response to be compatible with the hybrid computer handling model.

Ultrasonics, Inc. Dynamic Science Division 1850 W. Pinnacle
Peak Rd. Phoenix, Ariz. 85027
Extended to 15 Oct 75
Increased \$5,295.00

DOT-HS-5-01047 Mod. 3

UNIFORM TIRE QUALITY GRADING - TREADWEAR

Tires will be tested on facilities at East Liberty, Ohio, and San Antonio, Texas, in order to evaluate the road surfaces used. In addition, a suitably instrumented car will obtain traces of lateral and longitudinal forces which are generated as the car typically transverses one complete circuit of each course. Using three (3) different types of tires, additional skid trailer measurements will be made on the "City" test courses of each facility.

Compliance Testing, Inc. 1140 North Freedom Rd. P. O. Box
351 Ravenna, Ohio 44266
Extended to 15 Aug 75
Increased \$4,950.00

DOT-HS-5-01069 Mod. 2

UNIFORM TIRE QUALITY GRADING - TREADWEAR

Research Triangle Institute P. O. Box 12194 Research Triangle
Park, N.C. 27709
No change
Increased \$42,750.00

DOT-HS-5-01131

CLASSIFICATION OF BRAKE LINING

A brake lining classification scheme based on developing a better understanding of the relationship between basic lining properties such as coefficient of friction versus temperature, rubbing velocity, prior history, etc, and vehicle braking performance has been proposed. Objective of this research is to determine the feasibility of this lining classification scheme and to perform certain foundation research for the development of the scheme. Basis for the feasibility determination shall be the ability to use the data for brake lining derived from full-scale inertia dynamometer tests to predict the performance of a suitable test vehicle at selected points in a modified FMVSS 105-75 brake test. The contractor shall perform such dynamometer testing, vehicle testing, and simulation required to demonstrate feasibility. Ore

The Board of Trustees of the University of Illinois Office of
Business Affairs Urbana, Ill. 61801
To be completed 12 Apr 76
\$75,050.00

DOT-HS-5-01133

MOTORCYCLE BRAKING SYSTEM

A simple physical model of a system that meets the objectives of braking in that the operator of a motorcycle has control of the braking system except when an unsafe braking situation is encountered has been shown effective. The contractor will conduct a comprehensive feasibility investigation of this system to show the performance improvement, and to determine the type of control required and the component specification necessary to build the optimum braking system. Physical parameters of a motorcycle will be used to develop an analytical model of the motorcycle front brake system based on vehicular parameters, road conditions, vehicle speeds and applied brake pressures. Completed analytical model will be used as a tool in design of a control system, results of which will specify the component requirements as to reliability, cost, physical size, power, and integration with existing vehicle. sho

Harry Diamond Laboratories Adelphi, Md. 20783
To be completed nine (9) months from date of contract award
\$50,000.00

DOT-HS-5-01138

HSL 75-9

DOT-HS-5-01136

**MATERIALS DEVELOPMENT FOR MOTOR
VEHICLE INSPECTION TRAINING**

One of the primary purposes of the Department of Transportation (DOT) periodic motor vehicle standard is to increase the likelihood that every vehicle operated on the public highways is properly equipped and is being maintained in reasonable safe working order. Vehicle inspectors who, through their inspection activities, determine if a vehicle conforms with applicable safety criteria, are key personnel in the successful attainment of this objective. A competent inspector is one who has been qualified through training to perform his duties and has been certified by the State. To provide necessary elements for appropriate instruction of such personnel, a package of printed instructional material, including a course guide, instructor's lesson plans, and a student study manual, is to be developed, field tested, and evaluated.

Dunlap & Associates, Inc. One Parkland Drive Darien, Conn. 06820

To be completed eleven (11) months from date of contract award
\$51,355.00

DOT-HS-5-01138

**TESTING OF MOTOR VEHICLE LAMPS,
REFLECTIVE DEVICES AND ASSOCIATED
EQUIPMENT**

Delivery orders under this contract will furnish compliance test results in accordance with FMVSS No. 108 (NHTSA Laboratory Test Procedure) dated October 1, 1974. Headlamp assemblies with sealed beam units, front devices, side devices, and rear devices for lighting will be tested.

Ball Brothers Research Corporation P. O. Box 1519 Boulder, Colo. 80302

To be completed twelve (12) months from date of contract award
Unit price per test

DOT-HS-5-01139

**TESTING OF MOTOR VEHICLE LAMPS,
REFLECTED DEVICES AND ASSOCIATED
EQUIPMENT**

Six (6) headlamp assembly devices with sealed beam units, single headlamp assembly will be tested in accordance with FMVSS No. 108 (NHTSA Laboratory Test Procedure) dated January 10, 1974. 0 19

Ann Arbor Testing Labs., Inc. P. O. Box 2078 6109 Jackson Rd. Ann Arbor, Mich. 48106

Per contract schedule
\$1,748.00

DOT-HS-5-01140

**TESTS OF VEHICLE SEATING REFERENCE USING
THE SAE J826 H-POINT MACHINE**

All available manikin installation procedures, reference materials, studies related to H-point and seating reference point (SRP) determination and variability will be compiled and thoroughly analyzed to assist in this study. Methodology for accurately determining the location of the H-point after each drop of the manikin to provide coordinates for graphical representation of the H-point and SRP variability will be developed. Emphasis will be on the driver's position installation in all procedures. The H-point machine testing data analysis will include variance of accuracy; statistical correlation of the reported workload with accuracy, repeatability and installation time data; and, computation of mean, variance and 99th percentile probability error in the location. The best procedure will be used as the installation in determination of H-point versus SRP variability. Location of the SRP in a vehicle is determined by correctly establishing the design three-dimensional reference system of orthogonal planes within the vehicle and the accuracy of its location is then measured. Combining data derived from H-point installations and SRP location data will determine the distance and direction between SRP and H-point locations. Various graphical means will be explored to show the size, shape, and tolerances of the H-point and the SRP envelope of data in order to make recommendations regarding the size of H-point to the SRP envelope, and to suggest ways to reduce the variability in location of both points.

Science Engineering and Analysis, Inc. 6320 Augusta Drive P. O. Box 671 Springfield, Va. 22150

To be completed twenty-six (26) weeks from date of contract award
\$26,900.00

DOT-HS-5-01142

**A STUDY OF THE RELATIONSHIP AMONG
FATIGUE, HOURS OF SERVICE AND SAFETY
OPERATIONS. PHASE II**

Human Factors Research, Inc. Santa Barbara Research Park 6780 Cortona Drive Goleta, Calif. 93017

To be completed eighteen (18) months from date of contract award
\$324,990.00

DOT-HS-5-01144

**EXPERIMENTAL FIELD TEST OF ICE CREAM
VENDOR MODEL ORDINANCE**

Prompted by accidents of pedestrians (usually children) being struck by a vehicle while going either to or from an ice cream vending truck, the National Highway Traffic Safety Administration (NHTSA) has developed the Model Ice Cream Truck Ordinance. While considered to have high potential as a countermeasure for this type of accident, further testing is necessary before nationwide implementation can be recommended. As currently written, the vendor ordinance is at variance with the Uniform Vehicle Code (UVC) in that it requires alternately flashing red lights to be displayed to the front and rear of the vehicle while vending. The UVC restricts such display to

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either school buses or authorized emergency vehicles. It is the intention of NHTSA to test these flashing red lights in a field test situation which will assess the behavioral and accident reduction effectiveness of the countermeasure, and provide answers concerning such unresolved elements as enforcement strategy, adverse effects, and optimal signal configuration. Contractor will select test site, develop final version of the experimental design, produce selected materials to inform the public of the nature of the ordinance, and collect the pre-test data necessary for the comparative analysis to be made in the study.

Dunlap & Associates, Inc. One Parkland Drive Darien, Conn. 06820
To be completed eighteen (18) months from date of contract award
\$128,687.00

DOT-HS-5-01146

BASIC ORDERING AGREEMENT (TIME & MATERIALS TYPE) WITH TASK ORDERS FOR CONTACTS WITH MOTOR VEHICLE OWNERS OBTAINING PHOTOGRAPHS AND ACCIDENT REPORTS RELATED TO SAFETY DEFECTS INVESTIGATIONS

In order to determine facts which pertain to the allegations of safety related defects reported by vehicle owners, individuals as designated by the National Highway Traffic Safety Administration (NHTSA) will be interviewed by the contractor. When possible, the failed component will be examined for cause of failure, measured, and photographed before repair is made. Each obtained failed part is to be tagged to show name of owner of the vehicle from which it came, date when it was obtained, and problem to which it related. A detailed, comprehensive report will be made on findings in each case. Of N

Traffic Safety Research Corporation 1010 Corporation Way
Palo Alto, Calif. 94303
To be completed twelve (12) months from date of contract award
\$50,000.00

DOT-HS-5-01147

BASIC ORDERING AGREEMENT (TIME & MATERIALS TYPE) WITH TASK ORDERS FOR CONTACTS WITH MOTOR VEHICLE OWNERS OBTAINING PHOTOGRAPHS AND ACCIDENT REPORTS RELATED TO SAFETY DEFECTS INVESTIGATIONS

In order to determine facts which pertain to the allegations of safety related defects reported by vehicle owners, individuals as designated by the National Highway Traffic Safety Administration (NHTSA) will be interviewed by the contractor. When possible, the failed component will be examined for cause of failure, measured, and photographed before repair is made. Each obtained failed part is to be tagged to show name of owner of the vehicle from which it came, date when it was

obtained, and the problem to which it related. A detailed, comprehensive report will be made on findings in each case.

Value Engineering Company 2550 Huntington Ave.
Alexandria, Va. 22303
To be completed twelve (12) months from date of contract award
\$50,000.00

DOT-HS-5-01148

BASIC ORDERING AGREEMENT (TIME & MATERIALS TYPE) WITH TASK ORDERS FOR CONTACTS WITH MOTOR VEHICLE OWNERS OBTAINING PHOTOGRAPHS AND ACCIDENT REPORTS RELATED TO SAFETY DEFECTS INVESTIGATIONS

In order to determine facts which pertain to the allegations of safety related defects reported by vehicle owners, individuals as designated by the National Highway Traffic Safety Administration (NHTSA) will be interviewed by the contractor. When possible, the failed component will be examined for cause of failure, measured, and photographed before repair is made. Each obtained failed part is to be tagged to show the name of the owner of the vehicle from which it came, date when it was obtained, and the problem to which it related. A detailed, comprehensive report will be made on findings in each case. Of N

General Adjustment Bureau, Inc. 123 William St. New York, N.Y. 10038
To be completed twelve (12) months from date of contract award
\$50,000.00

DOT-HS-5-01151

LABORATORY TEST PROCEDURE

Nineteen (19) 1973 air bag equipped Chevrolets are to be tested. 0 10

General Motors Corporation General Motors Technical Center
Automotive Safety Engineering Warren, Mich. 48090
To be completed 30 May 75
\$20,900.00

DOT-HS-5-01152

TRAILER BRAKE PERFORMANCE

Analysis of the braking performance of passenger cars and light trucks, towing recreational and utility trailers, will be made by computer simulation in order to determine the characteristics of the towed and towing vehicle including geometry, brake design factors, and usage factors which have a major influence on the brake performance of the vehicle combination, and to develop and recommend a specification and test rationale by which the satisfactory brake performance of the combination can be assured by controlling the brake performance of the towed vehicle in a safety standard. The analyzed conditions shall include but not be limited to: lightly loaded towing vehicles and fully loaded trailers and vice versa;

the effect of tongue loads and drawbar lengths; towing vehicle and centers of gravity; the performance of on-board trailer brakes and their actuation systems versus no trailer brakes; the effect of braking mismatch between the towing vehicle and the trailer, including time delays, brake proportioning, etc.; and, the effects of wind gusts and other external disturbances on the combination vehicles in their braking modes. Full-scale verification tests based on FMVSS No. 105-75 will be run and compared with the simulation tests, and a detailed analysis of the test results and data to determine the validity and applicability of the test procedure for supporting an NPRM addressing a standard and/or the issuance of a consumer information bulletin will be presented by the contractor.

University of Michigan Division of Research Development and Administration Research Administration Bldg., North Campus Ann Arbor, Mich. 48105

To be completed twelve (12) months from date of contract award
\$177,420.00

DOT-HS-5-01153

DEVELOP MOTOR VEHICLE MATERIALS INDUSTRIAL PROCESSING RATES

A data bank on a 1975 Pinto subcompact car is to be established, with identification of subassemblies and components by weight, material types, processing methods, high-volume industrial fixed and variable cost-per-pound, and/or other industry practice measurement. 0, b

Pioneer Engineering & Manufacturing Company 2500 E. Nine Mile Rd. Warren, Mich. 48091

To be completed nine (9) months from date of contract award
\$82,032.00

DOT-HS-5-01158

UNIFORM TIRE QUALITY GRADING TESTING FACILITY

Auxiliary ramps, roads and calibration pads are to be constructed for use in testing of tires. 0lie

Department of the Air Force HQ6940th Air Group (USAFSS) Goodfellow Air Force Base Texas 76901

To be completed twelve (12) months from date of contract award
\$74,544.00

DOT-HS-5-01159

SAFETY STATUS DATA COLLECTION METHODOLOGY

New approaches to survey and re-assess the safety status of vehicles-in-use, particularly at the State level, are to be explored. Evaluation procedures will be developed to measure the effectiveness of a federally recommended periodic Motor Vehicle Inspection (PMVI) program and of existing State inspection programs. Designed to provide a means of quality control as well as a means for measurement and evaluation of both field and administrative inspection program operations of

each program under examination, the evaluation procedures shall essentially consist of a methodology for collecting relevant State or Federal inspection program field or administrative data, and a data analysis procedure to provide for the evaluation of the obtained data. Available data shall be examined and explored as to pertinence, availability, and accessibility. Data collection procedures shall be developed, assessed, and selected in order to provide optimum analysis procedures and tools for measuring the effectiveness of the inspection program being evaluated. PMVI programs to date have been justified primarily on the theory that if mechanical defects cause accidents and PMVI reduces accidents, then PMVI must reduce accident and fatality rates. It is now considered desirable to conduct a PMVI evaluation or experiment which will measure on an absolute basis the impact of a federally recommended PMVI program on vehicle defect levels and on accident, fatality, injury, and property damage levels. Methodology for determining how to measure the impact of a federally recommended PMVI program on vehicle defect levels, and on accident, fatality, injury, and property levels will help determine the feasibility or non-feasibility of a PMVI evaluation.

Avco Systems Division 201 Lowell St. Wilmington, Mass. 01887

To be completed eighteen (18) months from date of contract award
\$152,393.00

DOT-HS-5-01160

MOTORCYCLE ACCIDENT FACTORS AND IDENTIFICATION OF COUNTERMEASURES

It is the purpose of this research to increase the understanding of the motorcycle accident causal and severity factors to such an extent that this will provide the basis for programs aimed at reducing the motorcycle accident frequency and severity. Covering both rural and urban primary and secondary motorcycle accidents, the contractor will study human, vehicular, and environmental elements involved; evaluate safety equipment, clothing and protective devices, and features which contribute to the driver/passenger serious or fatal injuries; and, develop appropriate countermeasures that are conclusive, can be implemented, and which would reduce the rate and severity of motorcycle accidents. Sampling for study is to reflect national distribution of motorcycle accidents in regard to urban/rural; single/multiple; intersection/non-intersection; collision/non-collision accidents. Full-scale data collection effort, processing, and analysis, and development of related countermeasures will be made of on-site in-depth investigations involving such persons as motorcycle specialists, highway safety engineers, physicians, and interviewers. Data from police accident reports will be compared with that of on-site investigations. Final statistical analysis, oriented toward determining the relationship between the different variables of the driver, motorcycle, and environment, will be the basis for countermeasures for motorcycle accidents and accident severity reduction. 0o m

University of Southern California University Park Los Angeles, Calif. 90007

To be completed within twenty-eight (28) months from date of contract award
\$381,754.00

September 30, 1975

DOT-HS-5-01169

DOT-HS-5-01161

COMPARATIVE DATA IN STATE MOTOR VEHICLE ADMINISTRATION

Based on the responses to a comprehensive questionnaire to be developed by the contractor and distributed to all States, the contractor will collate, analyze, prepare for publication and deliver to the National Highway Traffic Safety Administration (NHTSA) a comparative data report in various functions of motor vehicle administration including fields of: driver licensing; driver improvement; auto registration; motor vehicle inspection; and other data pertinent to the functions, operations, and administration of those agencies. An objective assessment of needs on a State by State basis with a summation of findings for each major section of the report shall be prepared with supportive analytical tables and graphs. Special areas of concern will be highlighted and major trends identified.

American Association of Motor Vehicle Administrators 1201 Connecticut Ave., N. W. Suite 910 Washington, D.C. 20036
To be completed ten (10) months from date of contract award
\$55,000.00

DOT-HS-5-01163

URBAN CROSSING PROBLEMS

In a previous study (1971) of pedestrian accidents, causal patterns for approximately 17% of the reported urban accidents could not be specified, yet a distinguishing factor of these accidents was that they occurred primarily at intersections. The present research program will be to observe pedestrian and driver behavior at urban intersections to identify potential causal factors. A procedure for observing and recording pedestrian/driver behavior to be implemented at a selected sample of intersections, will be developed and conducted in two (2) phases: an observation procedure and, a data sampling and analysis plan. A closed circuit TV will be used to monitor the pedestrian/driver behavior in such a way that the participants will be unaware of the observation system. Data collected is to be analyzed to identify behaviors and those that are classified as hazardous will be ranked in terms of their frequency of occurrence and potential for precipitating vehicle/pedestrian accidents under varied conditions.

Applied Science Associates, Inc. P. O. Box 158 Valencia, Pa. 16059
To be completed fifteen (15) months from date of contract award
\$149,990.00

DOT-HS-5-01165

MOTORCYCLE OPERATOR MANUAL AND KNOWLEDGE TEST (DEVELOPMENT AND PRELIMINARY EVALUATION)

The contractor shall develop a manual and then draw test items from the subject matter areas covered in the manual. This is to provide adequate preparation for the test for licensing of a motorcycle operator. Content of the manual shall be confined to that which is necessary to safe motorcycle

operation and shall compliment the MOTOR VEHICLE OPERATOR'S MANUAL.

National Public Services Research Institute 421 King St.
Alexandria, Va. 22314
To be completed twelve (12) months from date of contract award
\$31,544.00

DOT-HS-5-01166

PARTS RETURN PROGRAM

The Parts Return Program, involving the submittal of defective automotive components to the contractor by independent repair shops on a voluntary basis, has been in operation for some time. It is intended to gather information on these components to help the National Highway Traffic Safety Administration (NHTSA) identify the existence of safety-related, manufacturing defects in motor vehicles and motor vehicle equipment. The contractor will assure that at least three (3) failed automotive components are received from at least 500 different independent repair shops in a year's time. Shop participation is voluntary but participants will be asked to provide identification tags for those components which are submitted. Identification tag information will give complete description of the part, failure, date removed, vehicle and model year, vehicle mileage, owner's name and address, and whether the faulty component is original manufacture equipment or replacement. Analysis code and component data sheets will be kept for use in a computer retrieval system by NHTSA. 0 of

Kappa Systems, Inc. 1501 Wilson Blvd. Arlington, Va. 22209
To be completed twelve (12) months from date of contract award
\$69,321.00

DOT-HS-5-01168

ENFORCEMENT FREQUENCY, SANCTIONS AND COMPLIANCE LEVEL FOR PEDESTRIAN SAFETY

The potential safety value of traffic laws and compliance laws is to be investigated in a search to modify unsafe driver behaviors through the influence of the traffic laws system. While voluntary compliance is desirable, it is expected that enforcement will be a necessary part of future safety programs involving the use of traffic laws. The contractor will review the state-of-the-art of the impact of enforcement level and/or the type of sanction on compliance level. An experimental procedure for measuring and collecting data for an appropriate group will be submitted. pat

Dunlap & Associates, Inc. One Parkland Drive Darien, Conn. 06820
To be completed 5 Jun 76
\$78,394.00

DOT-HS-5-01169

BASIC ORDERING AGREEMENT (TIME AND MATERIALS) WITH TASK ORDERS, FOR INSPECTION AND TESTING SERVICES OF MOTOR VEHICLE EQUIPMENT AND FABRICATION OR

MODIFICATION OF VEHICLE EQUIPMENT AND CONTROL SYSTEMS

Inspection and testing of motor vehicle equipment will be done in the following representative areas: radiography, ultrasonic, eddy current, yuglo, x-ray, magna flux, and infra-red; strain gauge, stress analysis; failure analysis, failure mode demonstrations, and surveys to investigate causes and frequency of failures; fabrication, modification and/or configuration changes of automotive and motorcycle equipment and validation of proposed changes; illustration and photography; measurement of gas concentrations such as CO, CH, NOX in the 5000 to 10,000 PPM range; measurement of carbon monoxide or other gas concentrations at levels of less than 1000 PPM; hydraulic (test stand) and pneumatic testing.

Value Engineering Company 2550 Huntington Ave.
Alexandria, Va. 22303
To be completed twelve (12) months from date of contract award
Per Task Order

DOT-HS-5-01170

BASIC ORDERING AGREEMENT (TIME AND MATERIALS) WITH TASK ORDERS, FOR INSPECTION AND TESTING SERVICES OF MOTOR VEHICLE EQUIPMENT AND FABRICATION OF MODIFICATION OF VEHICLE EQUIPMENT AND CONTROL SYSTEMS

Inspection and testing of motor vehicle equipment will be done in the following representative areas: radiography, ultrasonic, eddy current, yuglo, x-ray, magna flux, and infra-red; strain gauge, stress analysis; failure analysis, failure mode demonstrations, and surveys to investigate causes and frequency of failures; fabrication, modification and/or configuration changes of automotive and motorcycle equipment and validation of proposed changes; illustration and photography; measurement of gas concentrations such as CO, CH, NOX in the 5000 to 10,000 PPM range; measurement of carbon monoxide or other gas concentrations at levels of less than 1000 PPM; hydraulic (test stand) and pneumatic testing.

General Environments Corporation 6840 Industrial Rd.
Springfield, Va. 22151
To be completed twelve (12) months from date of contract award
Per Task Order

DOT-HS-5-01173

POST ASAP DATA COLLECTION AND ANALYSIS IN THE NASSAU COUNTY ASAP AREA

The Office of Driver and Pedestrian Programs is interested in extending, for evaluation only, those projects which were not extended operationally. Evaluation is to determine impact during a two (2) year post-ASAP period resulting from the continuation or discontinuance of the demonstration type countermeasures. Certain basic criterion and performance data should be collected and reported in order to evaluate the post-ASAP alcohol countermeasure environment. Recommended data to be used in evaluation covers, in part, fatal crashes, injury crashes, blood alcohol concentration (BAC) levels, and en-

forcement patrol activity. An annual report is to provide an updated description of the community, the countermeasures in operation, and an overall evaluation of countermeasure impact on the community. Analytic studies concerning evaluation of past and current treatment modalities and corresponding recidivism rates will be conducted only if the ASAP site has an adequate client tracking system for monitoring past rehabilitation client arrest, violation, and accident involvement activity; if the rehabilitation design contains random assignment, adequate control or comparison groups against which to evaluate treatment recidivism; and treatment modalities and/or continuations are clearly defined and mutually exclusive.

Dunlap & Associates, Inc. One Parkland Drive Darien, Conn.
06820
To be completed six (6) months from date of contract award
\$36,117.00

DOT-HS-5-01174

AN ADVANCED MEDICAL VEHICLE COMMAND AND CONTROL SYSTEM AND AN EMERGENCY MEDICAL INFORMATION SYSTEM

The city will implement an emergency medical services (EMS) system based upon the Medical Communications Assessment (MECCA) program of the Department of Transportation. Systems implementation will include components: command and control of emergency medical vehicles; emergency medical information system; public display and information on emergency medical services system; and, audio-video emergency medical technician training and evaluation. 0end

Philadelphia Health Management Command Philadelphia, Pa.
To be completed two (2) years from date of contract award
\$580,623.00

DOT-HS-5-01175

IMPLEMENTATION OF A MEDICAL EMERGENCY COORDINATION COMMUNICATIONS ASSESSMENT (MECCA) SYSTEM FOR THE DISTRICT OF COLUMBIA

Design plan for the MECCA resource and information system provides communication linkages to air ambulances, military hospitals, medical specialists, hospitals and emergency departments within the District of Columbia, as well as into the adjacent jurisdictions of northern Virginia and Maryland. System implementation includes: command and control of emergency medical vehicles; emergency medical information system; public display and information on emergency medical services system; and, audio video emergency medical technician training and evaluation.

District of Columbia Department of Human Resources
Washington, D.C.
To be completed two (2) years from date of contract award
\$497,582.00

September 30, 1975

DOT-HS-5-01188

DOT-HS-5-01178

ON BOARD VEHICLE SENSOR TECHNOLOGY

Research objectives are to: identify candidate subsystems and components in the brake, tire, steering, suspension, lighting, and signaling systems from which inspection and safety benefits may be obtained by means of on and off-board sensor techniques; determine specifically those candidate subsystems and components which require monitoring using on-board vehicle sensors and those requiring only periodic surveillance using off-vehicle equipment in conjunction with an interface device; develop, validate, and recommend optimum on-board sensor systems for both continuous and/or periodic monitoring of safety critical subsystems, and components.

AVCO Systems Division 201 Lowell St. Wilmington, Mass. 01887

To be completed twelve (12) months from date of contract award

\$122,416.00

DOT-HS-5-01182

MOTORCYCLE SAFETY EDUCATION CURRICULUM SPECIFICATIONS

Instructional program specifications for a motorcycle safety education curriculum are to be prepared for secondary school novice groups, adult novice groups, and advanced motorcycle rider groups. Students materials will encompass instructional, practice, and alternative materials. Instructor materials will include guidance and instructional aids. The necessary equipment, devices, and facilities will also be developed.

National Public Services Research Institute 421 King St. Alexandria, Va. 22314

To be completed 15 Dec 76

\$69,873.00

DOT-HS-5-01183

NATIONAL ACCIDENT REPORTING SYSTEM - PRELIMINARY INVESTIGATION

Design of the National Accident Reporting System (NARS) will be similar to that of the Fatal Accident Reporting System (FARS) except that it will include non-fatal accidents involving either towaways or injuries. Due to the number of accidents, NARS will be a probability sample of the non-fatal accidents. The contractor is responsible for determining sources of accident data, method of collection and recording of data of each State, the District of Columbia and Puerto Rico, and for determining if any unique or unusual factors are involved which might affect the sample design. Areas of availability of data already in tabulated form are to be identified.

Control Data Corporation 6003 Executive Blvd. Rockville, Md. 20852

To be completed six (6) months from date of contract award

\$136,175.00

DOT-HS-5-01184

CITIZEN PARTICIPATION TO IMPROVE HIGHWAY SAFETY

Using available data and reports, the contractor will identify and evaluate all techniques and procedures currently in use to detect and locate accidents and stranded motorists. This will include techniques reported in the literature and those with which operating personnel are familiar. Based on this review and analysis, he will prepare a report describing and evaluating procedures for accident and stranded motorists' location, indicating which procedures should now be recommended for use, and identifying unresolved issues requiring resolution. Based on these results, contractor will develop a research plan and arrange to conduct an experiment to test alternatives, and to determine recommended procedures for using citizen's reports in a single problem area, such as unsafe roadway conditions. An experimental plan along the lines of a road safety action center (DOT-HS-801-204) using telephone reports from citizens, and capable of handling reports on other safety subjects is to be developed for approval before its implementation.

The Regents of the University of Michigan 260 Research Administration Bldg. Ann Arbor, Mich. 48105

To be completed two (2) years from date of contract award

\$62,000.00

DOT-HS-5-01188

MANUAL BRAKE INSPECTION PROCEDURES

This research is an effort to systematically investigate, develop, and verify objective manual inspection criteria, techniques, procedures, and equipment aids to replace dynamic brake testing and existing subjective brake inspection procedures. Contractor will identify, evaluate, and develop alternative, equivalent techniques to replace the inspection capabilities afforded by the low-speed roller dynamometer which are related to brake performance. New inspection criteria should only be developed if no present criteria exist. Existing criteria should be re-defined for new techniques and procedures if necessary. Inspection time, skill level requirements, and objectivity of procedures must be maintained to minimize inspection cost per vehicle while maximizing inspection accuracy and repeatability. For the remaining brake system components requiring inspection not related to current braking performance, the contractor will evaluate and develop manual inspection criteria, techniques, procedures and aids to replace or modify existing items related to these nonperformance and visual brake inspection areas covered in both the Vehicle-in-use (VIU) Inspection Standards and the American National Standards Institute D7.1.

Avco Systems Division 201 Lowell St. Wilmington, Mass. 01887

To be completed eighteen (18) months from date of contract award

\$100,000.00

DOT-HS-5-01189

HSL 75-9

DOT-HS-5-01189

TIRE BREAK-IN PROCEDURES FOR HANDLING TESTS

The contractor will direct an effort to identify and characterize the nature and extent of a tire break-in problem in terms of the tire shoulder wear phenomena and their interaction with particular aspects of vehicle handling performance testing. A minimum of eighteen (18) passenger car tires of radial, bias-belted, and cross-bias construction will be tested in an endeavor to develop a workable and realistic means, either in the form of a new tire break-in procedure, or a modification to present a tire break-in, and vehicle handling test procedure, that would eliminate the problem or reduce its effect to an insignificant one for vehicle handling purposes. Results will be validated by full scale testing and the new tire break-in procedure or modified test methodology developed as an alternate means will be documented. 00t

Texas A&M Research Foundation Post Office Faculty
Exchange H College Station, Texas 77843
To be completed twelve (12) months from date of contract
award
\$125,150.00

DOT-HS-5-01190

TIRE-PAVEMENT INTERFACE VARIABILITY

The reliable measurement of vehicle handling performance at different test locations such as would be required with the enforcement of future handling standards is highly sensitive to the variability in test surface conditions found at various test sites in addition to tire and vehicle differences. Research to identify and describe the sources of tire-pavement interface variability for paved surfaces of similar as well as different skid number, and to devise appropriate means for controlling the effects of such variability on vehicle handling performance will be done by the contractor. Five (5) pavement surfaces and four (4) tire types will be utilized in measurement of tire lateral and longitudinal tractive forces. Vehicle handling tests of a current model year intermediate sized, domestically manufactured sedan as developed under contract DOT-HS-031-1-159 will be conducted. Resultant data from these tests will be analyzed for the sources of variability in tire-pavement interaction as it affects tire traction performance and vehicle handling. Analyses are to be structured to identify those aspects of tire and vehicle handling performance significantly affected by pavement to pavement differences at sub-limit as well as limit of performance. These analyses will be the basis for developing a procedure or methodology with which to adjust or normalize tire and vehicle handling performance data obtained over a range of pavement surfaces so that all data can be compared with reference to a common tire-pavement interface condition or level.

Texas A&M Research Foundation Post Office Faculty
Exchange H College Station, Texas 77843
To be completed twelve (12) months from date of contract
award
\$172,639.00

DOT-HS-5-01191

VEHICLES-IN-USE SUB-LIMIT MANEUVERS

A set of vehicle sub-limit performance maneuvers designed to be sensitive to changes due to outages and degradation and to assess the effects of brake, tire, and steering/suspension component degradation on vehicle stability and sub-limit performance will be developed. Two (2) late model cars will be used in the derived set of maneuvers including a road camber change maneuver; a vehicle bump maneuver; a lateral wind maneuver; and, a steering wheel returnability maneuver. Maneuvers will be so designed that vehicle performance parameters relative to vehicle control and stability are measurable. Vehicle performance when in a new condition will be used as a baseline for measuring changes in vehicle performance as a result of component degradation. Performance factors such as vehicle heading angle stability and vehicle path repeatability will be considered important in vehicle sub-limit performance. Data from these sub-limit maneuvers will be incorporated into the existing computer program of the National Highway Traffic Safety Administration (NHTSA) Hybrid vehicle. A validation test program will be conducted to verify the previously derived vehicle sub-limit maneuvers and the modified computer simulation. Only the selected vehicle test conditions which the computer simulation predicts as the most meaningful will be executed by the test vehicles. Performance parameters (vehicle roll rate, yaw rate, pitch rate, lateral acceleration, and longitudinal acceleration) of these test vehicles will be measured in the laboratory and used in computer simulation. 0men

Systems Technology, Inc. 13766 S. Hawthorne Blvd.
Hawthorne, Calif. 90250
To be completed 31 Dec 76
\$188,967.00

DOT-HS-5-01192

HUMAN FACTORS REQUIREMENTS FOR FINGERTIPS REACH CONTROL

Based in part on an analysis of driver problems with fingertip controls, the contractor shall attempt to identify a limited number of key questions and hypotheses which can cover the most significant problems associated with fingertip control, and then formulate an approach to answering these questions and resolving the hypotheses. To gain the necessary information to implement the project, the contractor will review the data collected in a recent survey taken of approximately 400 drivers who drove cars equipped with controls mounted on stalks attached to the steering column. The contractor, in addition, will interview drivers who use cars equipped with fingertip controls in order to allow observations of the vehicle and to note the particular control configuration characteristics of the respondent's car that may be causing difficulties for the driver. In this way, key problem areas needing more controlled experimental testing may be identified for additional study. Final recommendations that develop from these studies will be incorporated into an automobile and compared in terms of driver performance, with typical "good" and "bad" existing control configurations. 0 ma

Wayne State University 5050 Cass Ave. Detroit, Mich. 48202
31 Oct 76
\$91,327.00

September 30, 1975

DOT-HS-5-01201

DOT-HS-5-01193

YOUNG PROBLEM DRIVER IMPROVEMENT PROGRAM

The United States Air Force Safety Education Multi-Media Course, "Survival in the Traffic Jungle" (MM7), developed through a cooperative agreement with the Air Force and the National Highway Traffic Safety Administration (NHTSA) will be evaluated for its crash reduction potential by a State through a contract with NHTSA. Young problem and near-problem drivers will be randomly assigned to treatment and control groups. Upon completion of the instructional program each individual's driving record will be monitored for two (2) years to determine subsequent crash and conviction experience. Conducted in three (3) phases, site or sites providing an adequate sample of young problem and near-problem drivers (2,000 each group) will be chosen for testing. An additional 200 drivers will be selected to provide comparative data. Trained driving instructors will be used to administer the treatment program and a long term follow-up of individuals in the experimental and control groups will be made for comparative analysis and evaluation in terms of program effectiveness for reduction of crashes, deaths, injuries and property damage, and reduction in violations.

Texas A&M Research Foundation Post Office Faculty
Exchange H College Station, Texas 77843
To be completed four (4) years from date of contract award
\$315,494.00

DOT-HS-5-01196

MOTORCYCLE LICENSING AND EDUCATION PROGRAM

The contractor in cooperation with other appropriate State agencies, and the National Highway Traffic Safety Administration, will develop an improved motorcycle driver licensing examination program and supplemental motorcycle driver education and training course. Test criteria will be adopted from, but not limited to, the elements contained in the MOTORCYCLE DRIVING TASK ANALYSIS, RECOMMENDED MOTORCYCLE DRIVER KNOWLEDGE TESTS, and RECOMMENDED MOTORCYCLE DRIVER SKILL TESTS developed by the Motorcycle Safety Foundation (MSF). The supplemental motorcycle driver education and training course will be adopted from, but not limited to, the BEGINNING RIDER COURSE developed by the MSF, and will be specifically designed to provide the skills and knowledges needed to pass the improved motorcycle driver licensing tests. By using refined MSF motorcycle driver skill and knowledge tests and a modified MSF BEGINNING RIDER COURSE to assure that randomly assigned licensees possess the basic knowledges and skills needed to drive safely in traffic, it is hoped to demonstrate that ungraded entry skills will result in a lower accident rate for novice motorcyclists. 1500 or more applicants are to be tested per year for two (2) years, with those failing the initial test to undergo the supplemental training prior to retesting. Analysis and evaluation of the accident and violation experience of participants shall produce recommendations for future motorcycle driver training and licensing.

California Department of Motor Vehicles 2415 First Ave.
Sacramento, Calif. 95818
To be completed three (3) years from date of contract award
\$570,240.00

DOT-HS-5-01200

EVALUATION AND CORRELATION OF DRIVER VEHICLE DATA

It is the intent of this study to analyze and correlate available technology with data relative to driver-vehicle systems. Using this information the contractor will identify safety relevant vehicle performance characteristics and requirement criteria based on fully objective and scientific procedures that will provide guidance for future test programs of this nature and provide direct support to rulemaking activities. By use of the closed-loop performance data presented in previous reports of the National Highway Traffic Safety Administration (NHTSA) and other available data, the contractor shall characterize the interaction between the driver and vehicle in safety related vehicle maneuvers. On the basis of these characterizations, the contractor shall draw quantitative conclusions concerning the behavior of drivers in various accident scenarios and on the manner in which vehicle factors influence this behavior. Contractor shall also utilize the existing open-loop performance data from a previous contract, the Dynamic Science experimental safety vehicle (ESV) results, foreign and domestic and other appropriate data for correlation of closed-loop and open-loop performance measures and limits, with emphasis on the relationship of vehicle dynamic capability to driver utilization characteristics. Findings are to rank the significant vehicle response characteristics and recommend the appropriate open-loop maneuvers for determining their value, as well as outline additional driver-vehicle and/or vehicle testing programs to provide the necessary basis for establishing requirements for Federal Motor Vehicle Safety Standard on vehicle handling.

Systems Technology, Incorporated 13766 S. Hawthorne Blvd.
Hawthorne, Calif. 90250
To be completed twelve (12) months from date of contract award
\$99,116.00

DOT-HS-5-01201

RESPONSE OF DUMMY AND CADAVER TO REAR IMPACT

Impact sled tests of unembalmed cadavers and of anthropomorphic dummies will be conducted so that a comparison may be made of the response to simulated motor vehicle rear impacts, especially with respect to head and neck motion. In addition, tests will be made with a dummy having the Japanese Itoh neck modification. Rear impacts will be performed with cadavers and dummies in a normal seated position on a specially designed bench test seat. In one series of tests, the back of the test seat will be rigid while in another series of tests the seat back will be allowed to deflect backwards in reaction to the force exerted on it during impact by the dummies and cadavers. Performance of the dummies and the cadavers is to be evaluated for comparison.

The Regents of New Mexico State University Physical Science Laboratory P.O. Box 3548 Los Cruces, N.Mex. 88003
To be completed six (6) months from date of contract award
\$119,995.00

HSL No. 75-9
SEPTEMBER 30, 1975

THIS ISSUE CONTAINS:

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570-580, 583, 585-587

**U.S. Department of
Transportation**

**National Highway
Traffic Safety
Administration**



Shelve in Sta.

Highway Safe

AVAILABILITY OF DOCUMENTS

Documents listed in **Highway Safety Literature** are not available from the National Highway Traffic Safety Administration unless so specified. They must be ordered from the sources indicated on the citations, usually at cost. Ordering information for the most common sources is given below.

NTIS: National Technical Information Service, Springfield, Va. 22151.
Order by title and accession number: PB, AD, or HS.

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and catalog or stock number.

Corporate author: Inquiries should be addressed to the organization listed in the individual citation.

Reference copy only: Documents may be examined at the NHTSA Technical Reference Division or borrowed on inter-library loan through your local library.

See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096.
Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the mission of the National Highway Traffic Safety Administration. Submit material, together with a written statement of approval for publication to:

Technical Services Division (N48-41)

**National Highway Traffic
Safety Administration**
400 7th Street, S.W.
Washington, D.C. 20590

Please indicate availability source and price for the material.

Special notice: Material published in HSL is intended only for information. References to brand names, equipment models or companies does not imply endorsement by the NHTSA or the U.S. Department of Transportation.

September 30, 1975

DOG-HS-5-01224

DOT-HS-5-01221

VISUAL PRESENTATION TECHNIQUES FOR ON-ROAD DRIVER TRAINING AND TESTING

To determine the feasibility of using various conventional or innovative visual storage and presentation techniques in on-road driver performance training and testing, the contractor is to identify major visual presentation parameters involved in driving. This approach will help to determine which visual techniques are best to use in the driver education and licensing system, and in the development of selected visual presentation methods in the driving environment. Approximate minimum and maximum visual requirements for parameters will be established for field of view of driver; illumination brightness and contrast; relationship between visual scene and vehicle speed, as well as position of the object viewed; motion of object or scene; distance from vehicle; and, reality of visual scene. Presentation techniques to be considered include conventional motion pictures or slides, computer or model generated visual displays and holography. A visual medium to be tested for suitability may be installed in field of view without interfering with the driver's normal viewing range through a windshield or back window. Techniques for selecting various visual scenes to be superimposed on the actual driving scene under control of a driving instructor or examiner are to be investigated, and a system developed which produces visual scenes upon demand by an instructor while the vehicle is in motion and the driver is occupied with the driving task.

Randomline, Inc. County Line and Mann Roads Huntingdon Valley, Pa. 19006

To be completed twelve (12) months from date of contract award
\$52,296.00

DOT-HS-5-01222

POST ASAP DATA COLLECTION AND ANALYSIS IN THE CHARLOTTE/MECKLENBURG COUNTY ASAP AREA

The Office of Driver and Pedestrian Programs is interested in extending, for evaluation only, those projects which were not extended operationally. Evaluation is to determine impact during a two (2) year post-ASAP period resulting from the continuation or discontinuance of the demonstration type countermeasures. Certain basic criterion and performance data should be collected and reported in order to evaluate the post-ASAP alcohol countermeasure environment. Recommended data to be used in evaluation covers, in part, fatal crashes, injury crashes, blood alcohol concentration (BAC) levels, and enforcement patrol activity. An annual report is to provide an updated description of the community, the countermeasures in operation, and an overall evaluation of countermeasure impact on the community. Analytic studies concerning evaluation of past and current treatment modalities and corresponding recidivism rates will be conducted only if the ASAP site has an adequate client tracking system for monitoring past rehabilitation client arrest, violation, and accident involvement activity; if the rehabilitation design contains random assignment, adequate control or comparison groups against which to evalu-

ate treatment recidivism; and, treatment modalities and/or continuations are clearly defined and mutually exclusive.

The Human Ecology Institute 7334 Chapel Hill Rd. Raleigh, N. C. 27607

To be completed 30 Jun 76
\$53,570.00

DOT-HS-5-01223

INFLUENCE OF ROADWAY DISTURBANCES ON VEHICLE HANDLING

A set of standardized roadway disturbance inputs is to be developed which should answer these questions: What percent of all accidents is caused by or have severity due to roadway disturbance inputs? What are the individual characteristic patterns of these disturbances which play a role in accidents? Where in the driving environment are these pavement disturbances likely to be encountered? To what extent are these pavement disturbances present in the driving environment? Characteristic patterns of real-world pavement disturbance inputs will be examined and documented. Safety related response characteristics of the driver/vehicle system to the disturbance inputs will then be evaluated to determine what characteristics the vehicle should possess in order for vehicle response to harmonize with known driver inputs, given typical roadway disturbances. Computer simulation will be used to facilitate evaluation of the roadway disturbance inputs in this task. The roadway disturbance inputs should satisfy these criteria: dynamic response to disturbance is safety significant (likely to result in an accident or increase the severity of an accident; be sensitive to vehicle parameters; disturbance is likely to be encountered in significant numbers in real-world; represents driver behavior in relation to vehicle feedback cues after traversal of disturbance. Onnd

Systems Technology, Inc. 13766 S. Hawthorne Blvd. Hawthorne, Calif. 90250

To be completed fourteen (14) months from date of contract award
\$178,444.00

DOG-HS-5-01224

VALIDATION OF STANDARD SURFACE REPRODUCIBILITY

Following a series of comparative tests of tires run on Federal Highway Administration experimental test surfaces, a detailed analysis and synthesis of the test results and data will be performed to determine the validity and practicality of utilizing standard surfaces of selected skidnumber in measuring and grading tire traction performance. If correlation between highway and standard surface is high and reliable the contractor shall also evaluate the alternative of utilizing standard surfaces, other than the Federal Highway reference surfaces, by the National Highway Traffic Safety Administration (NHTSA) and industry for system calibration prior to traction testing for compliance or certification. If there should be poor correlation between test sites or highways, he shall perform an analysis of the conditions involved to highlight discrepancies and deter-

DOT-HS-126-3-643 Mod. 5

mine or recommend corrective actions to finalize an objective standard surface/traction test methodology.

Compliance Testing, Inc. 1150 N. Freedom St. Ravenna, Ohio 44266
To be completed fifteen (15) months from date of contract award
\$193,200.00

DOT-HS-126-3-643 Mod. 5**DYNAMICS OF MOTORCYCLE IMPACT**

University of Denver Colorado Seminary Denver Research Institute University Park, Denver, Colo. 80210
Extended to 30 Nov 75
Increased \$88,441.00 \$88,441.00 0 a

DOT-HS-153-2-239 Mod. 17**ALCOHOL SAFETY ACTION PROJECT**

State of Idaho Traffic Safety Commission 2419 West State St. Boise, Idaho 83702
No change
Increased \$35,000.00 \$35,000.00 ncr

DOT-HS-223-2-383 Mod. 5**AUDIT OF CLUTCH CABLE FAILURES**

Automobile Club of Southern California P. O. Box 2890, Terminal Annex Los Angeles, Calif. 90051
No change
Increased \$30,000.00

DOT-HS-346-3-692 Mod. 4**MOBILE ORBIS III SPEED ENFORCEMENT DEMONSTRATION**

This new experiment is a follow-up to the fixed ORBIS III demonstration previously conducted. Objectives are to determine if ORBIS can impact the driving habits of drivers by causing them to reduce speed to comply with speed laws, to determine cost-effectiveness and possible cost-benefit of the photo-mechanical speed enforcement device utilized, and to compare cost-effectiveness data for a variety of highway patrol systems. Sensors to record volume and numbers of speeders will be placed along two (2) ten (10) mile road segments. Warning signs similar to radar warning signs will be placed along the roadways. A mobile ORBIS van, parked unobtrusively along the roadside, will monitor the passing motorists with cameras. Counts of vehicles and numbers of those exceeding the set speed limit will be made to provide data for the evaluation plan of the experiment. 01gh

City of Arlington P. O. Box 231 Arlington, Texas 76010
Extended to 31 Jan 76
Increased \$80,000.00

DOT-HS-354-3-716 Mod. 3**PILOT DIAGNOSTIC INSPECTION DEMONSTRATION PROJECT**

District of Columbia Department of Motor Vehicles 301 C St., N.W. Washington, D.C. 20590
Extended to 1 Sep 75
Increased \$94,700.00

DOT-HS-357-3-721 IA Mod. 5**PADSAP AGENCY ENROLLMENT AND COMPUTER SOFTWARE DEVELOPMENT**

Modification three (3) is revised to provide for examination of the differences in total accident characteristics as a function of truck vehicle weight, and examination of accident characteristics as a function of driver education and experience. Modification four (4) is revised to reduce the hours of actual computer processing to verify the correct operation of the software packages from 69 hours to a maximum of 37 hours.

L. G. Hanscom Field Bedford, Mass. 01730
To be completed 30 Jun 75
Decreased \$19,047.00

DOT-HS-358-3-730 Mod. 4**FATALITY ACCIDENT FILE**

Reports of all motor vehicle traffic accidents in which there is a fatality constitute the Fatality Accident File (FAF). Included are data describing the accident, roadway, vehicles, drivers, occupants and nonoccupants. The contractor will prepare and provide a report concurrently with its submission of cases which will identify the counts of each type of submission (initial cases, alterations/corrections, etc.).

State of Delaware State Police Headquarters P. O. Box 430 Dover, Del. 19901
Extended to 30 Jun 76
Increased \$2,675.00

DOT-HS-363-3-756 Mod. 3**TRAFFIC/RECORDS SYSTEMS TRANSFERABILITY MODEL MASTER PLAN DEVELOPMENT PROJECT**

Objective of this extension is to demonstrate the capability to implement traffic records systems computer software and related procedures as tested in Idaho and in West Virginia in other States. Existing procedures will be reviewed to identify differences in file content or function. The accident data base will be reviewed to identify changes in structure required to establish integration with the driver data base. The DATA BASE DESCRIPTION MANUAL will be updated to reflect the integrated accidents and driver data bases.

Idaho Traffic Safety Commission 2419 West State St. Boise, Idaho 83701
Extended to 30 Jun 76
Increased \$95,182.00

September 30, 1975

DOT-HS-5-01137 Delivery Order No. 2

**TESTING OF MOTOR VEHICLE LAMPS,
REFLECTIVE DEVICES, AND ASSOCIATED
EQUIPMENT**

Six (6) headlamp assembly devices with sealed beam units, single headlamp assembly will be tested in accordance with FMVSS No. 108 (NHTSA Laboratory Test Procedure) dated January 10, 1974.

Electrical Testing Labs., Inc. 2 East End Ave. New York,
N.Y. 10021
Per contract schedule
\$1,707.72

DOT-HS-5-01137 Delivery Order No. 3

DOT-HS-5-01137 Delivery Order No. 3

**TESTING OF MOTOR VEHICLE LAMPS,
REFLECTIVE DEVICES, AND ASSOCIATED
EQUIPMENT**

Two (2) tests will be made of hazard warning flashers and turn signal flashers in accordance with FMVSS No. 108 (NHTSA Laboratory Test Procedure) dated January 10, 1974.

Electrical Testing Labs., Inc. 2 East End Ave. New York,
N.Y. 10021
Per contract schedule
\$4,100.00

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

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